Towards a user-centered and dynamic construction of dimensional hypertexts' structures

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ABSTRACT

We consider documents as the results of dynamic processes of documentary fragments' compositions. We have experienced that once a substantial number of associations exist, users need some synoptic views. One possible way of providing such views relies in the organization of associations into relevant subsets that we call "dimensions". Thus, dimensions offer orders along which a documentary archive can be explored. Many works have proposed efficient ways of presenting combinations of dimensions through graphical user interfaces. Moreover, there are studies on the structural properties of dimensional hypertexts. However, the problem of the origins and evolution of dimensions has not yet received a similar attention. Thus, we propose a mechanism for helping users in the construction of dimensions. Our proposal has been implemented (in the context of DINAH, our multistructured documents framework) and validated with users from the humanities field. A poster will be presented and a demonstration of our prototype will be available.

Categories and Subject Descriptors

H.5.4 [**Information Interfaces and Presentation**]: Hypertext/Hypermedia Architectures; H.3.7 [**Information Storage And Retrieval**]: Digital Libraries—*User issues*

General Terms

Human factors, Design

Keywords

dimensions, hyperstructures, multistructured documents

1. INTRODUCTION

This work has to be considered in the context of a group of users who are editing together complex multi-structured documents. We will be interested in finding an effective way for the users to manage the growing complexity of the associations they create between documentary fragments.

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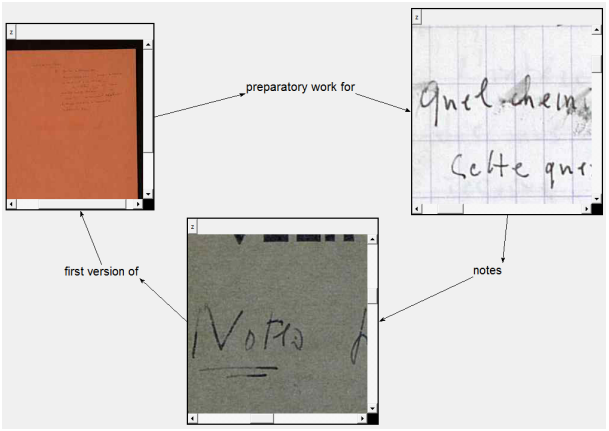

Figure 1: Screenshot of the graph-oriented module for the creation and the visualization of associations between documentary fragments

Users need to weave asociations between heterogeneous fragments (see Figure 1). It appeared very clearly that, once a substantial number of associations exist, synoptic views have to be created. One possible way of providing such views relies in the organization of the associations into relevant subsets that we will call "dimensions".

2. DIMENSIONS

We consider dimensions as being simple sets of associations. Moreover, if we want to help users define dimensions while letting them free of creating any kind of association, it seems like we have to rely on some structural properties that should remain independent of the meaning that is peculiar to a given association.

2.1 Dimensions' definitions

Hyperorders [1] are based on binary relations. A hyperorder is defined by the pair: $< F, \{D_1, D_2, \ldots, D_n\} >$ where the second member of the pair is a set of binary relations called *dimensions*.

A zzstructure [4] is a hyperorder with two additional restrictions:

- The dimensions are invertible: for each dimension D_m, there is a dimension D_m^{-1}.

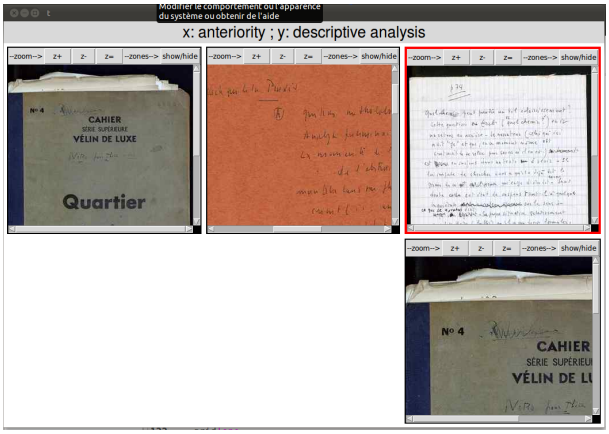

Figure 2: Screenshot of the dimension-based visualization module of DINAH

- The dimensions are partial functions.

With these restrictions, a zzstructure offers a linear way of navigating along dimensions (without the need of any hyperlinking engine). It has been proved [3] that a zzstructure is theoretically equivalent to an edge-colored graph.

Finally, "semantic webs" [2] are edge-colored graph with an additional restriction: the associations inside a dimension cannot form cycles.

2.2 Choice of a dimensional framework

We had the intuition that a presentation such as the one offered by zzstructures could, at least partially, answer this need for synoptic views. However, after we provided users with both a zzstructure like interface and a more classical graph-based interface in order to begin the creation of relations, we have been able to observe that the graph-based one was highly preferred. Therefore, it is obvious that two stages have to be distinguish: analysis and synthesis. Thus, in addition to the graph-oriented view, we provide the users with a dimension-based view (see for example Figure 2 where the temporal aspect of the associations "preparatory work for" and "first version of" has been synthesized in an "anteriority" dimension). Finally, we implemented a dimension model similar to the one of zzstructures. However, as will be explained in the following section, we also take into account, in a dynamic way, the acyclism constraint of semantic webs.

3. METHODOLOGY FOR THE CONSTRUCTION OF DIMENSIONS

We had to find a structural constraint whose violation is often meaningful and quite easy to dynamically detect. The acyclism constraint seems to be well adapted.

We let the users create relations between fragments of the archive. They may also group relations into dimensions in order to be able to use the dimension-based navigation module. For example, a user successively made some associations when a cycle appears within a dimension (see Figure 3). We then advise him to restructure the dimensions so as to

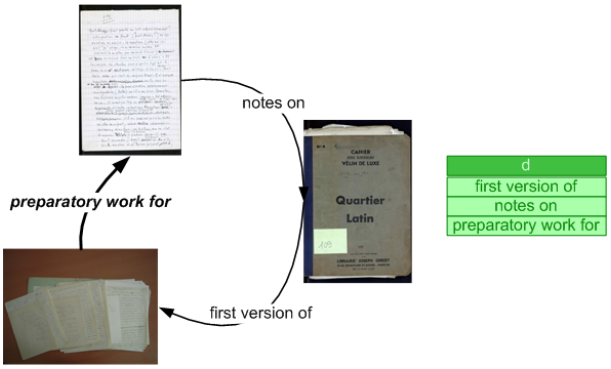

Figure 3: A cycle is dynamically detected within the dimension d

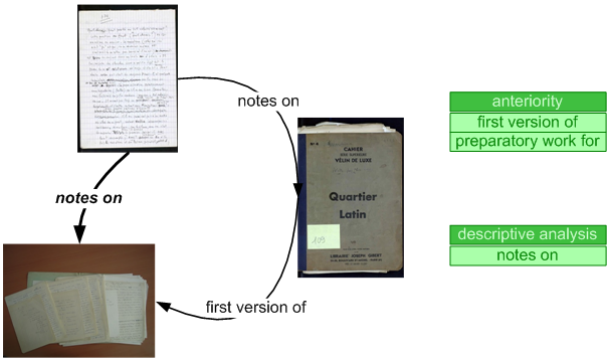

Figure 4: The automatic detection of a cycle was the occasion for the user to restructure the dimensions

remove the cycle. Our example gives an idea of this process (see Figure 4).

4. CONCLUSION

Finally, our lightweight methodology offers a simple mechanism for dynamically promoting a rational structuring of the dimensions. From the reduction of intra-dimensional cycles, knowledge is gained either about the inverse of dimensions or about the structuring of the dimensions.

5. REFERENCES

[1] J. Goulding, T. Brailsford, and H. Ashman. Hyperorders and transclusion: understanding dimensional hypertext. In *Proceedings of the 21st ACM conference on Hypertext and hypermedia*, pages 201–210. ACM, 2010.

[2] C. Joslyn. Semantic webs: a cyberspatial representational form for cybernetics. *Cybernetics And Systems Research*, pages 905–910, 1996.

[3] M. McGuffin et al. A comparison of hyperstructures: Zzstructures, mspaces, and polyarchies. In *Proceedings of the fifteenth ACM conference on Hypertext and hypermedia*, pages 153–162. ACM, 2004.

[4] T. Nelson. A cosmology for a different computer universe: data model, mechanisms, virtual machine and visualization infrastructure. *Journal of Digital Information*, 5(1), 2006.