

TOPIC MAPS: AN ALTERNATIVE OR A COMPLEMENT TO CONCEPT MAPS?

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Abstract. Our poster presents some basis which lead us to redesign the Project EA-2003-52 supported by the Spanish Ministry of Education about subject gateways, and at the same time tries to open a discussion about a new paradigm: Topic Maps, which is not very widespread, nowadays, but we think it can be interesting to incorporate into software engineering projects as a technical terminology. Not only it is new profound paradigm shift but also an unknown vision of how to represent knowledge in a smart way. Can concept maps be topic maps?

1 Introduction

Knowledge representation, semantics, ontologies, knowledge organization, metadata, XML, XTM, RDF, etc... Who have not heard to talk about these concepts once? How many times we have stopped thinking about them?, What is really their meaning?, How they are interrelated among them?, and what is more important: Are they really take place to any sort of innovation, or are we thinking about the same all the time?



Figure 1. Thinking about concepts

First, we have to describe what a topic map is. Topic Maps (<http://www.topicmaps.org>), identified as XTM, are now ISO standard (currently ISO/IEC 13250). As Fisher, Wandersee and Moody (2000) describe: "Topic Maps are included in a class of objects we refer to as knowledge webs. A knowledge web is an interconnected web of ideas that conveys in skeletal form not only a set of ideas but also how those ideas are organized and interrelated".

Second, topic maps are not just about navigating territories. As we can see, we can easily repurpose them for use in the display or discovery of knowledge. Carnot, Dunn and Cañas (2001) have proposed a web interface that, using concept maps, provides an integrated access for a knowledge domain.

And finally, classrooms all over the world are using concept maps for this purpose. When concept maps begin to display lots of information in a relational way, they imply a new question: "Can concept maps be topic maps?" If we happen to implement a concept map engine on top of the XTM specification, those concept maps would be converted to topic maps, which will gain the ability to be shared, merged, and archived in a standard format for future use.

2 A project prototype using Topic Maps terminology

Arriving at this point, our objective was to take up again a project we made for the Spanish Ministry of Education (Tramullas, 2003), last year. The project studied the Spanish subject gateways, and their potential use in e-learning environments. As one of the aims, we designed and implemented a software package, named *Potnia*, for creating and maintaining this kind of information resource. It was developed making use of non-declarative programming languages, a Relational Database Management System, and no special technique of information or knowledge visualization.

But on the other hand, the new versión will have this framework:

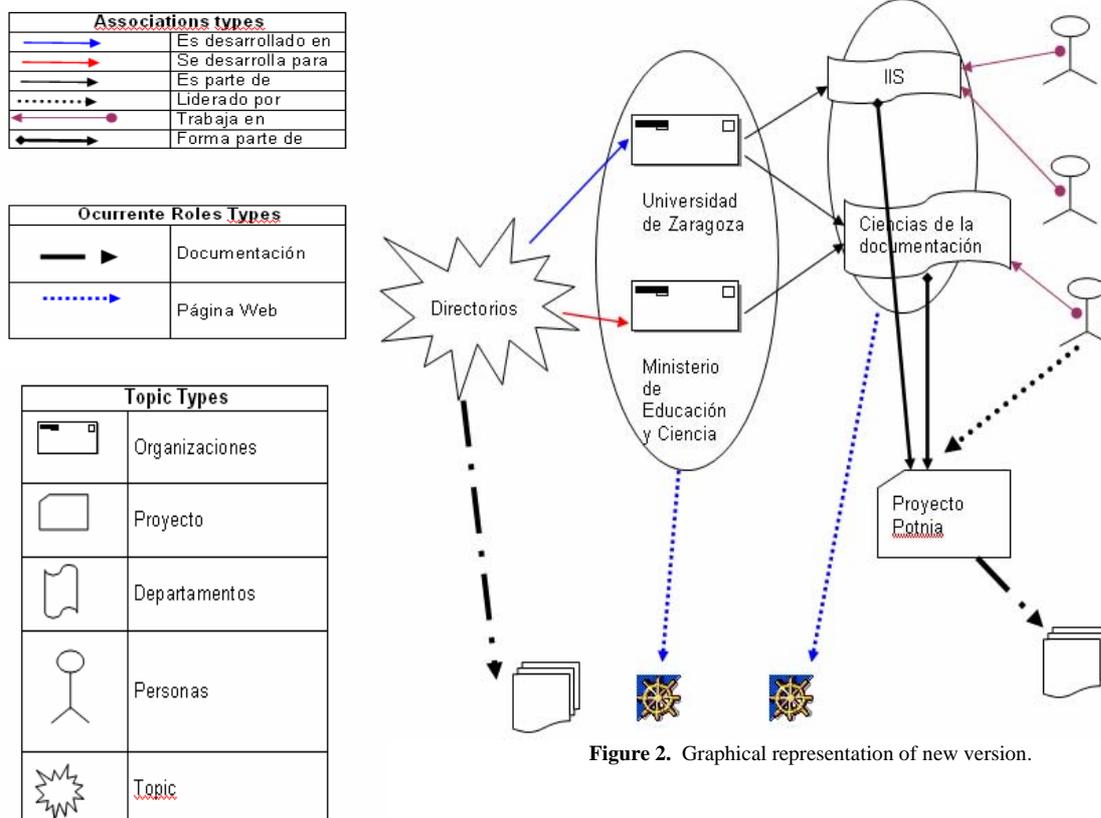


Figure 2. Graphical representation of new version.

3 Project basis

Only in a few items the theoretical conclusions:

1. Knowledge Organization, Topic Maps, and Knowledge Representation have a crucial issue: “to arrange for semantic interoperability”.
2. At the same time, semantic interoperability is a hot topic for the Semantic Web.
3. Concept Mapping doesn't apply anything vocabulary control and there is no rule for his building.
4. Visualization: visualization is a promising technique for both enhancing users' perceptions of structure in large information spaces and providing navigation facilities.

Several applications exist specifically designed to bring the approach of concept mapping (sometimes only mind mapping) to a computer's desktop: IHMC CmapTools, Mindjet MindManager, FreeMind, Mind Map Plus, Visual Mind, Inspiration, SimTech Systems MindMapper, etc. They all share the concept of concept/mind mapping, although having different goals. Some of them allow the user to export into several formats including HTML and XML.

But we have tried to find some visualization technique in XTM format. Karvonen, Rautama, Tarhio and Turkia (2001) proposed an specific markup language, named CML (*Concept Markup Language*), for creating concept maps, in order to represent it graphically. Finally, we can find one initiative at <http://www.mapasconceptuales.com>. It's an application developed by Cristófol Rovira, lecturer at Universitat Pompeu Fabra (Barcelona). A simple application developed in JavaScript.

So, there is no doubt in our decision: To redesign our application with XTM according to our theoretical conclusions (see figure 2).

In the context of digital hyperlinked information resources, it's clear that indexing, representation and navigation are sides of the same coin. Ross, (2000) has argued that is necessary to develop a model that combines indexing and concept mapping, in order to get sophisticated information retrieval tools. In a

referenced paper, Shipman and Marshall (1999) stated that spatial hypertext had features that suppose that users can take advantage of visual recognition, reasoning and communication, and graphical interactions.

4 On reflection

As you can see along our report, our premises were very clear but we have attempted to test to be true. Finally, we decided to use XTM to represent knowledge, but not using any Open Source software toolkit available since the main item of our project is the process of information research, and as we can see before this is one of the gaps of the XTM software developed till now.

According to the database design, we hold our statement design in XML Database, without making use of the object-oriented database model or the relational one. And taking again the visualization aspect, the discussion is still open because in the beginning, there was the concept map. Later, there was the topic map. Now, there is XTM, an XML language for expression and serialization of topics, associations, and scopes. Concept maps have their roots in pedagogy, while topic maps have their roots in HyTime and the information management communities. Then, what is the best solution?

As we have aforementioned, there is a lack of use of Topic Maps and his language XTM. It could be cause it is not very well known or it is immature, or it could be cause, by hundrum, we think in other technologies less complicated or more trendy to develop our projects. So, it is time to take into account XTM as a suitable technology, as we are making in the ongoing development of the following version of our subject gateways project.

When we read between lines Topic Maps specification, we can notice that the underlying conceptual model is not clearly explicit. But if *the power of concept mapping and semantic networking tools derives from the external support they provide for this internal process of knowledge building*, that is, concepts maps and semantic networks facilitate knowledge capture, knowledge construction, reflection on knowledge, knowledge refinement, knowledge communication, knowledge collaboration, and knowledge transfer, where is the difference?

If both are included into the concept of knowledge web, explained in the introduction. And considering Gorodetsky and Fisher definition for this concept (Gorodestky and Fisher, 1996): “Knowledge webs can also promote metacognition or thinking about thinking”, Why do not use topic maps as an alternative representation? Or being less radical, why do not use topic maps in combination with other techniques? There is no escaping the fact that the major forms of knowledge representation, including visuals, semantic networks, and text, will be much more powerful than any single form alone.

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References

- Bawden, D.,Robinson, L. “Internet Subject Gateways revisited”, *International Journal of Information Management*, 22, 2002, pp. 157-162.
- Brusilovsky, P. y Rizzo, R. (2003). “Using maps and landmarks for navigation between closed and open corpus hyperspace in Web-based education.” *The New Review of Hypermedia and Multimedia*, v. 8, n. 1, pp. 59-82.
- Cañas, A. J. et al. (2000). “Herramientas para Construir y Compartir Modelos de Conocimiento Basados en Mapas Conceptuales” *Revista de Informática Educativa*, v. 13, n. 2, pp. 145-158.
- Carnot, M.J., Dunn, B. and Cañas, A.J. (2001). *Concept Maps vs. Web pages for Information Searching and Browsing*. (manucript, available at <http://www.ihmc.us/users/acanas/Publications/CMapsVSWebPages.htm>, visited 6 march 2004)
- Fisher, K.M., Wandersee, J. H., and Moody, D. (2000). *Mapping Biology Knowledge*, Boston: Kluwer Academic.

- Gaines, B.R., and Shaw, M.L.G. (1995). "Concept maps as hypermedia components." *International Journal of Human-Computer Studies*, v. 43, n. 3, pp. 323-361.
- Gorodetsky, M., and Fisher, K.M. (1996). *Generating Connections and Learning in Biology*, New York: Springer Verlag.
- Karvonen, A., Rautama, E., Tarhio, J. and Turkia, J. (2001). "Versatile concept map viewing in the web." *ACM SIGSE Bulletin*, v. 33, n. 3. pp. 105-108.
- Moreiro, J.A., et.al. (2002). "Mapas conceptuales, topic maps y tesauros." In: *Actas de las Segundas Jornadas de Tratamiento y Recuperación de la Información JOTRI 2002*. Madrid: Univ. Carlos III.
- Novak, J. D. (1998). *Learning, creating, and using knowledge: Concept Maps as Facilitative Tools in Schools and Corporations*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Novak, J. D., and Gowin, D. B. (1984). *Learning How to Learn*. New York: Cambridge University Press.
- Park, J. (ed.) (2003) *XML Topic Maps*. Boston: Addison-Wesley.
- Ross, J. (2000). "A new way of information retrieval: 3-D indexing and concept mapping." *Learned Publishing*, v. 13, n. 2, pp. 119-123.
- Shipman, F. M. and Marshall, C.C. (1999), "Spatial hypertext: an alternative to navigational and semantic links." *ACM Computing Surveys*, v. 31, n. 4, pp. 1-5.
- Tramullas, Jesús (2003). Planificación y evaluación de directorios científicos especializados para Internet: su aplicación como instrumentos de docencia en sistemas de enseñanza y aprendizaje virtual. Proyecto EA-2003-52 (unpublished, available at <http://imhotep.unizar.es/invest/directorios>, visited 12-04-2003).