The Agoræ / Hypertopic approach

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Abstract

We briefly describe the Hypertopic model created by Tech-CICO lab and the Agoræ software tool based on this model. We focus on how this all-purpose Knowledge Management approach, that we have called "socio semantic Web", can help communities to formulate, to publish, or to broadcast knowledge, especially scientific knowledge in the field of Human and Social Sciences, where formal "ontology" approaches are often risky.

Key Words: Knowledge engineering, Topic map, Computer Supported Cooperative Work (CSCW).

1 Main features

We should aim to show how "Agoræ" approach can help scientific communities to create and to share knowledge, especially in the field of Human and Social Sciences. However, it must be noted that Agoræ/Hypertopic approach is an all-purpose ("generalist") one. It is addressed not only to scientific knowledge, but also to common sense knowledge, knowledge associated with expert practices in big firms, market places and e-commerce yellow pages, etc...

The Agoræ tool is a software platform used to build and maintain various knowledge maps based on the Hypertopic model recommending multiple *points of view*. Each of these Hypertopic maps deals with a given domain and is co-built by a given community. Conceptual tools associated within Agoræ are:

- the "HyperTopic" model which is a knowledge representation language allowing to build Hypertopic maps using a few basic concepts such as *Entity, Point of view, Topic, Association, Resource, Standard attribute*.
- the "Knowledge-Based Market Place" (KBM) model which is a cooperation model to co-build the map, with 3 predefined roles ("reader", "contributor", "semantic editor").

Through this platform, community members can describe and find domain entities and collections, by designing and browsing "multi-point of view" knowledge maps. Every contributor may declare the characteristics of an entity following an index structure made of several tree diagrams. Thus, the community would build a dynamic and collective meaning.

In a scientific field such as a Social Sciences one, the main use of the "semiotic" approach of Agoræ seems to be to share "cartographic" and documentary knowledge within a community, with a particular advantage: the Hypertopic knowledge map indexing *entities* and *resources* can be simultaneously built by numerous community members, according to multiple points of view. It is not necessary to impose a formal, centralized and logically coherent unique view on the knowledge field. Such a feature is crucial in interdisciplinary fields and recommended in fields such as sociology, economics, management science, etc., where many scientific currents and "schools" are competing. Each member with KBM role of "semantic editor" can create and locate topics in the map from his own point of view, with cooperative tools (groupware, forum…) facilitating negotiation and discussions.

A secondary advantage of the Agoræ / Hypertopic approach is to assist the information retrieval by navigating inside the Hypertopic map. We consider that, by the mean of this map, implying the mediation of an *entity*, the access is greatly facilitated to images and documents. As *Hypertopic resources,* documents are semiotic and interpreted. However, primary data can be highlighted as *standard attributes* linked with *entities.*

2 The basic Hypertopic model

To complete a more detailed presentation of Agoræ model and methodology, it is possible to consult precedent papers presenting the models, the tools and the method [2] [3].

Figure 1 shows how the HyperTopic model completes the "Knowledge-Based Market Place" (KBM) cooperation model to construct particular Knowledge map by a Community.

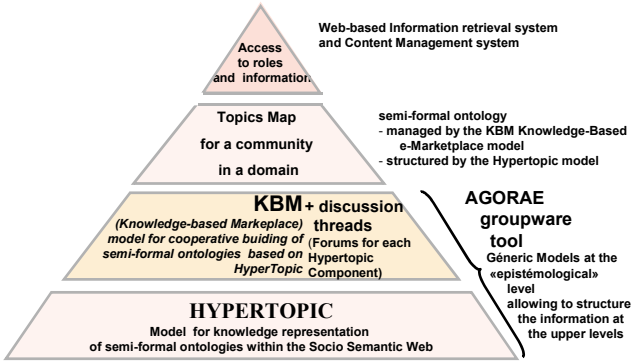

Figure 1 - Architecture of a socio semantic Web application based on Agoræ

Figure 3 (below) will show an example of an Agoræ map (in the case of the DKN project that we introduce in §5). It presents multiple points of view in a socio semantic Web approach according to HyperTopic model.

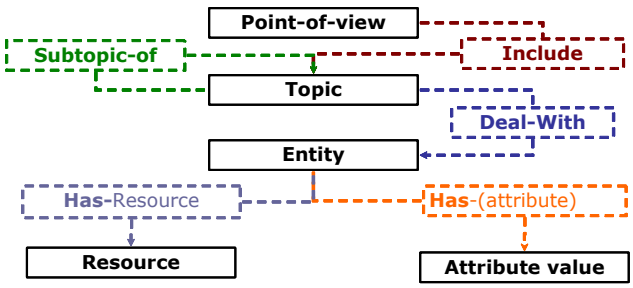

Figure 2 - HyperTopic Basis (associations are dashed)

Figure 2 (and the keys of figure 3) summarizes the HyperTopic components, presently implemented in the Agoræ V1version. Topics are not concepts but simple or complex linguistic expressions expressing "subjects". According to the Topic Map ISO standard [8], which has been a starting point in our reflexion to design Hypertopic, "*in some sense, a topic link reifies a subject*" and "*in the most generic sense, a 'subject' is any thing whatsoever, regardless of whether it exists or has any other specific characteristics, about which anything whatsoever may be asserted by any means whatsoever.*"

We also use this broad definition in HyperTopic. Like the Topic Maps (but unlike RDF standard), Hypertopic proposes to separe clearly the map and the documentary resource (*topics* are not key words nor metadata included in the resource). But in Hypertopic the basic set of elements that we propose to use to structure a map, is improved compared to the Topic Map ISO standard. In addition to the *topics*, *associations* and *resources* which take again standardized concepts of the topic maps, HyperTopic defines the concepts of *entity*, *point of view* and *standard attribute*.

In a lot of applications the information retrieval is applied initially to "objects" having a generic structure. Therefor we introduce the concept of *entity*. The *entity* (and not the documentary resource), is connected to the *topics*. Entities, like objects, include some descriptors allowing their "primary" characterization. Standard attributes and one or more occurrences of material resources carrying target information are associated to these descriptors.

The *point of view* is a descriptor to contextualize entities corresponding to a vision of certain actors. It corresponds to a set of characteristics of the *entity*, gathered and treated on several hierarchical levels, according to a vision meaningful for an actor or a group of actors (*e.g.* a point of view corresponding to a subgroup of practicians or to a scientific "current")

This definition of the Point of view distinguishes HyperTopic from the concept of *Facet* in XFML/FacetMap and from the concept of *Scope* in Topic Maps (cf. [3], p. 6)

3 Methodology: building the users' knowledge model

Points of view and *Topics* as "heuristic attributes" condense a real expertise and can create controversies during the co-design of the map, especially in a context of inter- or trans-disciplinarity. Studies in Computer Supported Cooperative Work (CSCW) – for example studies of coordinative practices using artefacts in architectural design [7] – show the importance of cartographic and spatial aspects for the continuous creation of a shared meaning in the community, including several points of view.

That's for in Agoræ "socio semantic Web" approach, non-formal approaches articulating points of view, topics and entities appears more suitable than formal solutions, in order to build cooperatively the representation of the domain. We try for example to refuse a pure "technology-driven" approach, based on the use of "semantic web" automated software agents using centralized and formal domain ontology. On the contrary, the Agoræ "socio semantic Web" approach requires a continuous human cooperation and a collective inquiry, which cannot be automated but can only be computer-aided. The HyperTopic model that we propose for that is a knowledge representation model that takes place at an epistemological level [1].

An Agoræ map is a semiotic ontology which does not include properties inheritance and cannot (generally) be used to compute automatic inferences. But it constitutes a semantic network which is structured at an epistemological level and which depends on the human interpretation context, partially organized through *Points of view*.

To co-build a semiotic ontology, HyperTopic gives to a shapeless non-formal semantic network a structured topic map form tuned to the HyperTopic standard concepts and rules. But these topics and their relations within the map need a high intervention of the human actors to fully complete the meaning in context. Topics, relations and map components are human-relevant (to the given actors having created or modified them). Actors' operations are precisely logged by the system to enlarge the awareness within the group of co-builders.

According to [6] who have studied communities with actors such as experts or scientists, it is necessary "*to be aware of processes of the constructive ambiguation of concepts - what Leigh Star has referred to the creation of boundary objects which can sit between multiple communities and share just enough meaning for the purpose at hand while being understood quite differently*".

In the Agoræ approach, users' "models" are Hypertopic knowledge map. They are built by community members themselves, who make explicit by that mean "positive cognitive conflicts" (see §5).

As a consequence, there is not a formal "link" between models and documents, but a plurality of actors' "views" onto entities referred by documents: actors, experts, community sub-groups (for example scientific dissident currents or competing "schools") can use the heuristic attributes (*topics* contextualized by *points of view*) to interpret and highlight different facets of the *entities* they have subjectively "seen" or "read". For example, a set of singular entities can be a set of research subjects, a set of domain objects, a collection of documents such as in Figure 2, etc. Experts of various disciplines, or scientists from different current or schools, do not necessarily give attention or "read" the same objects in these viewed entities.

To resume this approach, in the Agoræ cooperative methodology, a Hypertopic knowledge map is a "semiotic ontology" [9]. Community members' information space – even in "positive" scientific fields such as biology (see §5) – can be considered as being a vast zone of uncertainty open to actors inquiry. Following our Hypertopic representation paradigm, "objective" information can be considered as a *standard attribute values*, as well as an *heuristic attribute* (*topic*) dealing with an *entity*. These choices of representation are let to the actors. For those modelling choices, and for information to be considered relevant (or not), conflicting interpretations first have to be identified (that is the goal of building an ontology) and then perhaps overcome (that could be the goal of building an Agoræ interaction space).

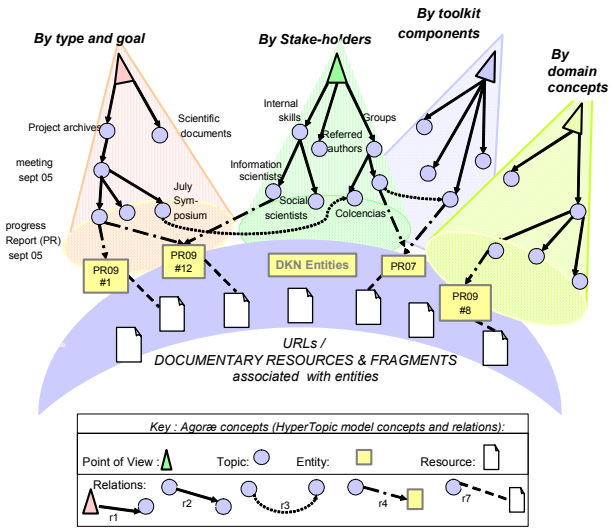

Fig.3 - Example of (a part of) an Agorae Knowledge Map structured by the Hypertopic model

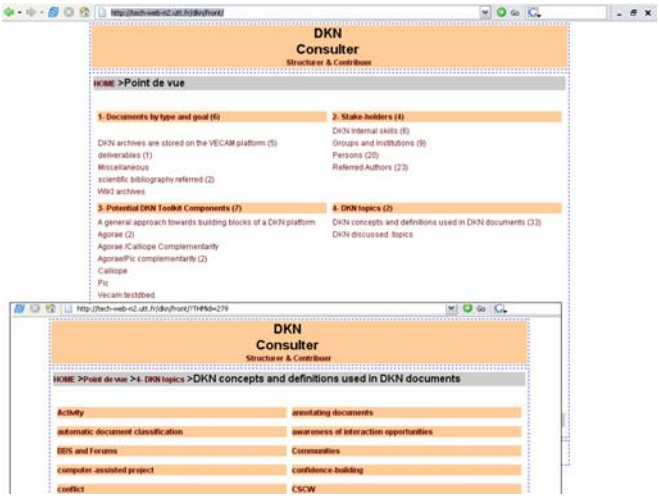

Fig.4 – Agoræ DKN-Map application, "consult" role

4 Tool demonstration

Agoræ proposes interaction features depending on the three users' roles:

- Consult page (Fig.4), reading: users have a general view upon all viewpoints, and can browse among several hundred topics. For each topic at all levels, users can see corresponding entities, and topics transversally related to this topic.
- "Semantic editor" role for creation or modification of a point of view or of a topic (Fig.5-a, b, d) : authorized members can create a topic, modify its name and comments (definition, remark), its location in the tree.
- Creation of a singular entity (Fig.5-c: the user describes the entity by filling a text box, and by linking it to any topic under a given viewpoint. Contrary to reading pages, this is restricted to authenticated members.

Extensions of Agoræ are planned or under development, to enable the socio semantic Web. For instance, to better enable the co-construction "at run-time" of a shared meaning, and better understand the conditions that may level difficulties, we want to add measuring tools to the system, in order to trace and analyze communications and discussion threads by topics on the micro-forums.

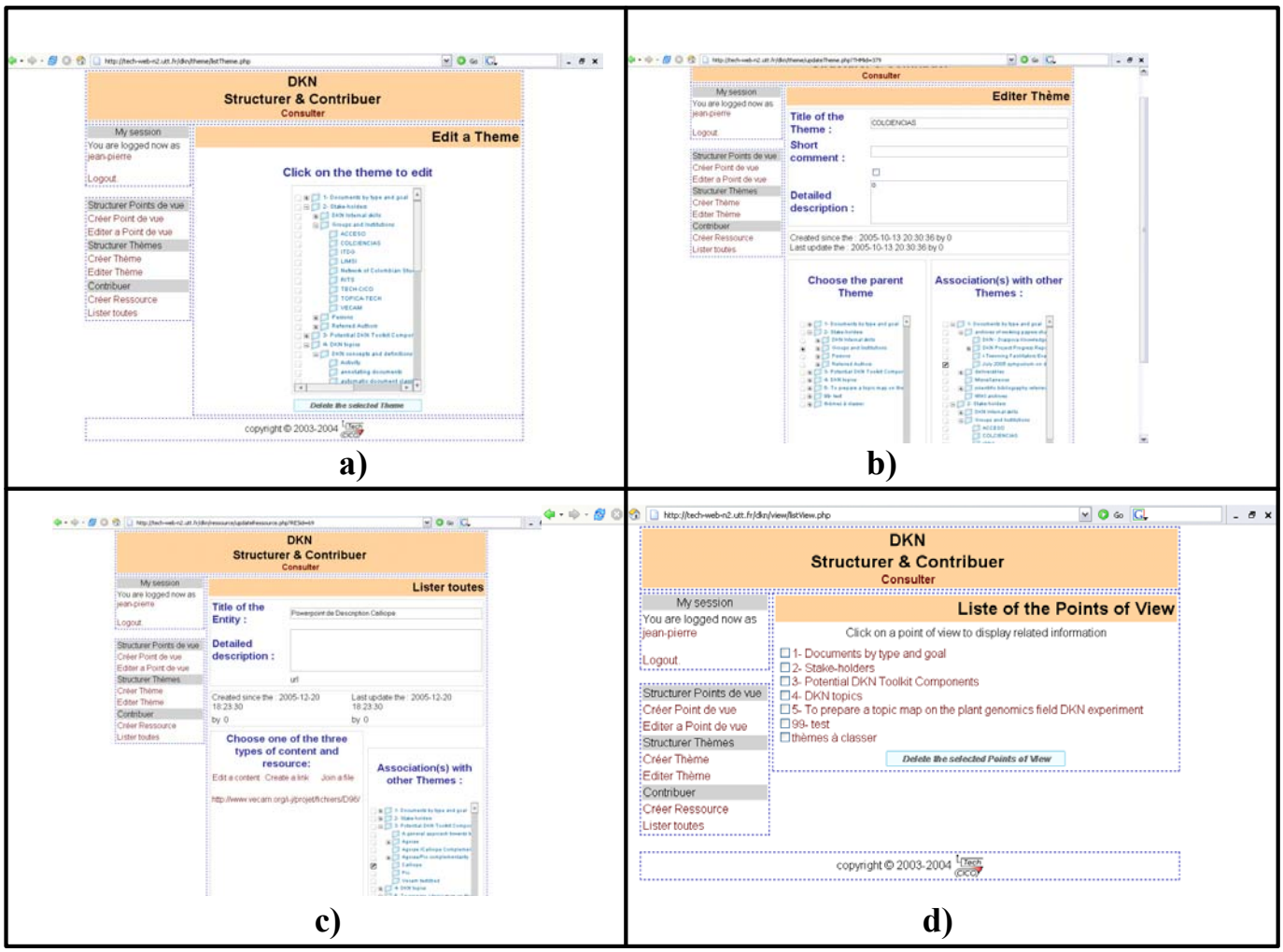

Fig.5- "Contributor" and "editor" roles in the Agoræ DKN-MAP example

a) Research of an existing Topic (« Semantic editor » role)

b) Changing the location and transversal links of this topic (« Semantic editor »)

c) Creation and multi-indexing of a singular entity (« Contributor »)

d) Add/ Modify a point of view (« Semantic editor »)

5 Managing conflicts of interpretation with Agoræ

Today information is available from a wealth of sources an in a variety of formats through Internet. This is particularly true in the social sciences, but it has been noted [5] that for example sociologists (at least in France) are reluctant to use Internet as a source of information for their scientific practices. We will first report on research undertaken to better understand the reasons for this reluctance and then go on to describe software we are developing to help overcome it. Agoræ and the associated method propose an information space, an interaction spaces and ways of social mediation.

We do not have yet experimented Agoræ in the human science field, but actually we apply Agoræ and Hypertopic to a scientific community (in the field of plant genomic) within the DKN project (Diaspora Knowledge Network) [4]. This project is supported by UNESCO, and conducted in collaboration with William Turner's team at the LIMSI Lab. In a step of this project, Agoræ (within a larger groupware platform) assists Colombian research project teams (whose cooperating members are simultaneously based in Europe and in Colombia) in their distant work, including the construction of knowledge maps, referring to documents and domain objects in the particular scientific field of each group. For example, teams of genomic searchers will use the tool to build information spaces containing both the topic map and the documents of the project. Assistance is provided by an Agorae representation model that is dynamically bootstrapped and updated by members themselves (with the intercession of a "mediator" role inside the group) . The map serves as a mean of visualizing different points of view and their diachronic evolution, with a particular attention given to manage with Agoræ possible disagreements between geographically and/or semantically distant searchers.

In the objectives of this project, we assume that conflict is an essential part of the knowledge production process. It improves group performances when discussions concern such things as how tasks should be managed, the relevancy of information, appropriate frameworks for interpretation etc. However, we also know that these "positive cognitive conflicts" are often highly correlated with "negative relationship conflicts". As a consequence, an important goal of the knowledge management that we propose with Agorae in the DKN context is to maintain a healthy level of positive "cognitive conflict" while avoiding relationship conflicts. Thus the experiment with Agorae in the context of this DKN project will focus methods, concepts and techniques for managing "ontological disagreements" as a way of achieving this goal. This experiment will be conducted from Mars to June 2006 simultaneously in France and Colombia, and we shall have already some return in june 2006.

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