

# HyWebMap documents : an collaborative e-schoolbag for E-learning

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**Abstract** –Building dynamic spaces of personalized knowledge from WWW is an usual activity for any netsurfer in search of informations. Particularly in e-learning trainings, e-learners apply this kind of cognitive strategies to integrate knowledges and expertises proposed by e-teachers through on-line resources. In such context, e-learners have to elaborate conceptual documents which traduce constructivist activities and summarize new knowledges indeed, explicitation of their own comprehension paths, and social relationships with teachers, tutors or students who take part in the knowledge acquisition process. XML technologies, learning models and objects are now mature enough to inspire such structured documents which can instanciate knowledge acquisition and learning processes. In the framework of a collaboration with University of Picardie which proposes 6 fully on-line e-learning trainings, we are adaptating HyWebMap structured documents for experimental collaborative e-schoolbag.

## I. INTRODUCTION

Nowadays, E-learning environnements provide more than a substitution device of traditional higher education. It's evident that we assist to a wide mutation of higher education because it's the whole society which operates a wide mutation. Most experts effectively agree that our post-industrial society disappears in aid of a Society of Information.

It's evident e-learners have to build their (professional) knowledges themselves. Teachers, instructors provide them educational rules, propose expert knowledges, high level point of views. E-learner of e-learning are current instances of constructivist approach initiated by Piaget, Vygotski and Bruner.

Effectively, the society of information has considerably change education ways. Education is no longer an initial step in a future professional life for each other. With the society of information, it's a perpetual constraint to update knowledge in future jobs turning around information and communication activities, whose features change frequently.

We try to converge our approaches : E-learning experiences of University of Picardie and 15 years old experiences of Paragraphe Laboratory in the wide domain of Hypertext and Hypermedia. Our recent researches are focused on search engines (NeuroWeb) [10], agents, aggregative virtual networks and collaborative work.

### *Educative Hypertext as Structured Document*

15 years ago, Hypertext completely revolutionized the respective role of author and reader. By defining his own reading paths through hyperdocuments, answering his own logic of reading, the reader gradually transformed himself

into author. With Hypertext, it is a new relation between authors and readers which appears [12][15].

Revolutionary in its concept, Hypertext, in its practical application, gave the day only to very few achievements of scale. Reading paths remaining captive from hypertext systems.

With Internet, the proliferation of Web pages within the cyberspace generalizes these hypertext principles of reader/author by projecting them in a structural space where software constraints are extremely reduced [8][13].

Traditionally, students evaluate their knowledges by contextual exercises, proposed by teacher and instanciated by homeworks. This complementary homework of the teaching is an objective and individual validation and confrontation among knowledges dispensed by teacher with self-integration. So, homework represents really an educative package made up of material and abstract elements : from one side, web learners' notes, teacher's documents and exercises, in other side, individual questions, tests/mistakes, remarks and comments.

Then, learner builds his own representation of knowledge proposed by the teachers. Alone, and/or with exchange with others students, learner elaborates his own paths in knowledge.

## II. NEW USES, NEW DOCUMENTS

Practices in information retrieval change, the demographic explosion of electronic documents originated from the Web, testify to this obviousness [2][3]. Methods of exploitation of such electronic documents are proved to be as complex as retrieval techniques themselves [5][7][9].

We describe here a new type of documents located at the convergence of the world of structured documents and hyperdocuments [4], whose Web sites are the most recent illustration.

More than a virtual document, the "document-network" is an independant document which results from handling of HyWebMap software, developed by our research group to reorganize information [13]. (HyWebMap can be downloaded at <http://h2ptm.univ-paris8.fr>). It is the object resulting from the construction of these spaces of knowledge in which we are interested. Originality of HyWebMap in terms of approach, concept and uses was underlined by scientific community and numerous conferences where it was presented (ACSI, TICE, CAPS, Hypermédiat & Apprentissages, ISKO,...).

### Composite Nodal Document

XML documents produced by our software are to be regarded as entities composed from multiple fragments. Each fragment is interdependent and give a structural and semantic coherence to the documents where they are integrated.

This architecture is particularly highlighted by the search engine dedicated to the exploitation of HyWebMap document. Indeed, the collaborative system K-Web Organizer [14] proposes original mechanisms of search from composite nature of HyWebMap documents.

We can say that internal structure of documents determines the future possibilities of content management which answers 5 points :

1. With Web, we constat that retrieval uses have completely changed,
2. Information retrieval is standardized (information available on line),
3. We attend a development of collaborative work (transversal relation, hierarchic relation,...),
4. Powerful search engines (google, inktomi, northernlight...) and directories (yahoo, nomade,... ) reference quickly web content and propose query results classified by relevance,
5. Markup Languages are more and more integrated (HTML, XML technologies, ...).

Today, a document is a compilation of sources (and not only a compilation of contents !) with personal annotations of authors, shareable entirely or partially.

### III. HYWEBMAP: AN AGGREGATIVE SYSTEM OF WEB RESOURCES

In its most elementary handling, HyWebMap makes it possible the netsurfer to constitute starting from heterogeneous resources (Fig. 1) taken from Internet and/or Intranets - exploitation of the one and others being possible - and also starting from private resources (documents HTML created by the user), an electronic composite book which we call virtual site or personal knowledge space.

HyWebMap offers a whole of functionalities making it possible to implement these virtual networks through, on the one hand mechanisms of nodes and links management and, on the other hand sites administration processes (update agents, search engines querying, integrated search, dynamic generation of web sites...).

This aggregative way is observable at the cyber-retrievers, whose principal activity consists in retrieving the most relevant information related to a field, a subject or a research topic, in order to place them at the disposal of specific users (enterprises departments, communication agencies, specialized librarians, ...).

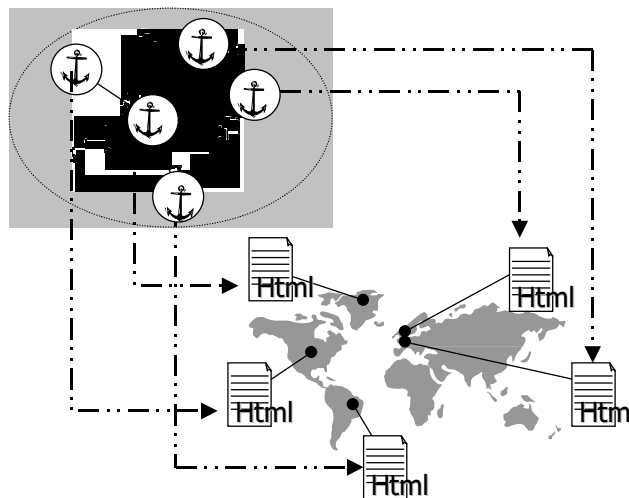


Fig. 1. HyWebMap Concepts

#### Nodes and Links in HyWebMap

HyWebMap architecture is based upon the concept of untyped "free node" whose vocation is to be used as support with the heterogeneous data element that the user will affect to him. This free node is associated with these properties :

1. Identifier (name)
2. Web resources (URI or HyWebMap document) ,
3. descriptors or keywords,
4. annotations.

Significant aggregation of various sources of information is related to the nature of the relationships being able to exist between several elements. Link naming functionalities will offer the Hywebmap designer to preserve relationships.

Univocal links within a HyWebMap virtual network allow the declaration of transverse relations which lead to the creation of an hypertext network.

#### Knowledge representation of the domain and learners' profiles

Ontologies [8] are certainly an important way to determine the knowledge area where learners will move around. But, the most drawback of this representation is the unavoidable construction of such ontology with hierarchy, classification, dependencies...on relevant terms with their relationships. And that is necessary for each knowledge area. Such knowldege contextualization is well-known - and difficulties to - in the elaboration of thesaurus [1]. Moreover, it's inevitable to create such ontologies for learner's profiles in the framework of Higher Education and Trainings.

In HyWebMap approach, we didn't retain explicit declaration of ontologies, we use pre-determined virtual networks known as "reading paths" in Hypertext, these

reading paths are expert's point of view for different learners' profiles. Each new identified profil produces new expert's path. Table 1 represents XML DTD of HyWebMap documents whose instances are teachers' courses (notions, relationships, illustrations in or outline, ...) or learners' homeworks and notes :

- **Created by teachers**, these HyWebMap documents are guidelines for e-learners and may be annotated with learners' points of view (questions, remarks, difficulties,...) or embellished with e-learners' HyWebMap documents, in order to illustrate cognitive inferences of learners to appropriate themselves knowledge dispensed by a teacher.
- **Created by e-learner**, HyWebMap document is for example, the result of exercises or homework to be delivered to teachers. These documents may be shared by different e-learners.

HyWebMap documents instanced in XML compose this virtual e-schoolbag which represents this subtitle link among inside learning activities (i.e the "place" of training) and outside learning activities (at home for example).

Table 1. HyWebMap DTD

```
<?xml encoding="ISO-8859-1"?>
<!ELEMENT hwm doc (generic_keyword_list?, nodes )>
<!ATTLIST hwm doc subject CDATA #REQUIRED>
<!ELEMENT generic_keyword_list (gterm)*>
<!ELEMENT gterm EMPTY>
<!ATTLIST gterm
id_gterm NMTOKEN #REQUIRED
content CDATA #REQUIRED>
<!ELEMENT nodes (node*)>
<!ELEMENT node
(annotations?, specific_keyword_list?,
author_keyword_list?, links?, web?)>
<!ATTLIST node
id_node NMTOKEN #REQUIRED
title_hwm CDATA #REQUIRED>
<!ELEMENT annotations (annotation*)>
<!ELEMENT annotation (#PCDATA)>
<!ATTLIST annotation
id_annotation NMTOKEN
#REQUIRED>
<!ELEMENT specific_keyword_list (stern_global |
stern_local )*>
<!ELEMENT stern_global EMPTY>
<!ATTLIST stern_global
idref_gterm NMTOKEN
#REQUIRED>
<!ELEMENT stern_local EMPTY>
<!ATTLIST stern_local
id_stern NMTOKEN #REQUIRED
content CDATA #REQUIRED>
<!ELEMENT author_keyword_list (aterm)*>
<!ELEMENT aterm EMPTY>
<!ATTLIST aterm
content CDATA #REQUIRED>
```

```
<!ELEMENT links (internal_link)*>
<!ELEMENT internal_link EMPTY>
<!ATTLIST internal_link
from NMTOKEN #REQUIRED
to NMTOKEN #REQUIRED
type CDATA #REQUIRED>
<!ELEMENT web EMPTY>
<!ATTLIST web
title CDATA #REQUIRED
url CDATA #REQUIRED>
```

### *Reorganization retrieved information*

In addition, we note that practices of search of informations on the Web are not always turned towards the search for "THE" answer [6] but more frequently towards the constitution of convergent references than the survey devices or portals have very largely highlighted. Web collectors now integrated in the browsers for a long time offered to netsurfers the possibility to constitute thematic web sites within local spaces of reorganized information. Thus, HyWebMap documents can store informations collected from World Wide Web by e-learners in order to ameliorate understanding of teachers' courses or resolution of exercises.

### *Educational Experience*

Since 1997, Université of Picardie Jule Verne has developed for continuing education an E-learning environment called INES (INteractive E-learning System). This e-learning software integrates 3 mains components :

- Administration,
- Tutor management,
- On line Content Management (Courses, Exercises, Homeworks, informations, ...)

These components allow administrative and teaching frameworks (mail tutoring, IRC, Newsgroups, homework, physical and virtual grouping, FAQ,...) for electronic training.

Today, Université de Picardie Jules Verne proposes 6 fully on-line trainings (<http://www.dep.u-picardie.fr/>) :

- 1) DEUST Technician for Information System (recognized by French Internet Service Providers Association),
- 2) A master's degree "cost-efficient technology and management"
- 3) Advanced graduate diploma "Multimedia Information System",
- 4) Degree "Multimedia Project Management"
- 5) Degree "Fundamentals for Multimedia"
- 6) Access Degree for Higher Education (DAEU)

Currently, we are adapting our system HyWebMap (developed in Java) to Ines E-learning environment (ASP and PHP). Our application seems to reply to e-learners' cognitive expectations ; breaking intellectual isolation despite mail, newsgroups and IRC supported by Ines.

More, this integration needs software adaptation but specific trainings to teacher, tutors and learners.

## IV. CONCLUSION

As shown, old-fashion hypertext's users, net surfers, E-learners, develop same difficulties, same expectations in (re)organization of informations.

Transposed in individual or professional situations, high education or trainings contexts, we constat a very strong similarity, accentuated by World Wide Web and accessible information in constructivist approach of Internet's users. Retrieve, share, exchange, comment, re-write, describe...are common actions for synthetic documents. E. Barret describe in 1987, the Education Online System (EOS) an hypertext based system which proposed many functionalities for e-trainings. Beyond the properties of EOS, interaction between learners, between teachers were present in the system not in the documents.

Now education and training are fundamentally changing with the society of information.

Proprietary systems, encapsulated knowledges with our information era are no longer allowed.

HyWebMap functionalities bring variations into the manner of apprehending author systems. Without being distinguished like a genuine publishing tool, HyWebMap largely exceeds the context of use of the systems primarily reader.

Capacity with being able to organize sources of distinct and remote information, to supplement them by personal data elements (personal pages, annotations) make of HyWebMap a hybrid product between the 2 tendencies of systems.

However, from the only point of view of the operation of aggregation of information resources which results in producing a new space of data coherent and semantically homogeneous within the same network, it is undeniable that this software concerns author's behavior. The possibilities of generation of Web sites still accentuate this feature.

Virtual networks worked out by authors, produced or not in Web sites, are "expert browsing paths" which could be placed at the disposal of new users, who themselves will be possibly inspired by designing new networks and that in an endless "reading/creation" process.

This operating mode introduces the premises of a collaborative use of HyWebMap into the creation and the consultation of data spaces. In the situation of current implementation of HyWebMap, it is clear that this form of collaborative activity remains extremely dependent on the rigour of all the authors taking an active part in the evolutions of the same virtual space.

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