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Project-Team ACACIA

Acquisition des Connaissances pour l'Assistance à la Conception par Interaction entre Agents

Sophia Antipolis

THEME 3A

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2. Overall Objectives

2.1.1. Context and Objectives

Our multidisciplinary project aims at offering methodological and software support (i.e. models, methods and tools) for knowledge management (i.e., for building, managing and distributing a corporate memory). This research can be extended to any organization or community.

2.1.2. Research Topics

We study the case where the building of a corporate memory relies on use of knowledge underlying documents, on the management of links between documents and knowledge bases or on the modelling of multiple

viewpoints. We study knowledge acquisition, modelling and management from multiple expertise sources (experts and documents).We are especially interested in several scenarios of corporate memory: technical memory, profession memory and project memory, in particular in concurrent design, skills management and scientific and technological watch.

We study the problems raised by the dissemination of knowledge through a knowledge server via the corporate Intranet or via the Web: we consider the semantic Web as a privileged way for supporting management of knowledge distributed either inside a company or between several companies. We aim at building knowledge servers enabling search for information in a heterogeneous corporate memory, this search being "intelligently" guided by ontologies and ontological annotations.

This work is a contribution to the construction of a semantic Web for a company or a community. We focus on the case of a corporate memory materialized in the form of a XML-based corporate semantic Web.

For representing ontologies or knowledge models, we use the CommonKADS acquisition method, Sowa's conceptual graphs formalism and the languages of the XML galaxy (especially RDF - Resource Description Framework).

Our research topics can be decomposed as follows:

- Support for Corporate Memory Construction:
  - Methodology for building a corporate memory.
  - Multi-agents architecture for corporate memory.
  - Project memory and technical memory for concurrent design.
  - Management of multi-expertise:
    * Acquisition, modeling and capitalizing knowledge from several experts.
    * Managing multiple expert models, multiple ontologies, multiple points of view.
  - Acquisition, modeling and capitalizing knowledge from texts.
- Support for Corporate Memory Broadcast and Use:
  - Knowledge Servers on a Semantic Web.
  - Tools for Querying and Browsing Ontologies and Documents.
  - Support to "Intelligent" Information-Retrieval, guided by ontologies.
  - Multi-agents System for Information Retrieval in a Distributed Corporate memory and for Proactive Dissemination.

2.1.3. International and industrial relations

Our work was applied in the context of the IST project CoMMA. We collaborate or collaborated with industrialists in the field of aeronautics (Aerospace, Dassault-Aviation, EADS), of the car industry (Renault), of telecommunications (CSELT, T-NOVA, Telecom Valley), of the service integration (Atos Origin) or with research center in accidentology (INRETS), in civil engineering sector (CSTB). We recently started collaborations in the field of health (Nautilus) or biology (IPMC). We have international relations with Griffith University and CSIRO (Australia), Parma University (Italia) and T-Systems Nova (Germany). We take part in the OntoWeb thematic network.

3. Scientific Foundations

3.1. Foundations

Key words: *Artificial Intelligence*, *Cognitive Sciences*, *Knowledge-Based System*, *Knowledge Acquisition*, *Knowledge Capitalization*, *Knowledge Management*, *Knowledge Engineering*, *Knowledge Server*, *Corporate Memory*, *Ontology*, *Assistance to the User*, *Co-operation*, *Multiexpertise*, *Multiagent System*, *Concurrent Engineering*, *Conceptual Graph*, *Structured Document*, *World Wide Web*, *XML*, *RDF*, *OWL*, *Semantic Web*, *Information Retrieval*.

Knowledge Management (KM) is one of the key progress factors in organizations. It aims at capturing explicit and tacit knowledge of an organization, in order to facilitate its access, sharing out and reuse [7][6]. The considered organization can be an actual enterprise or a public organization, but it may also just consist of a given department or service; it can also be a group, or a community, or a virtual enterprise (made of members possibly stemming from different companies, gathered by a common interest). An organization is made up of people interacting for common objectives, in an internal environment and with an external environment. These persons may have different functions and tasks in the organization, different competencies, knowledge, opinions, and work methods and they may produce explicit traces of their activities. In the framework of their individual or collective tasks, they may need to find people able to give them useful information or to find somewhere (in a document, a database, a CDROM, a film, etc.) such helpful information.

The members of the organization have individual knowledge (that may explicit, implicit or tacit), as well as individual and collective objectives in the framework of their group or of the whole organization. The organization has global objectives and KM must be guided by a strategic vision. This vision enables to determine the main organizational objectives for KM:

- Improve knowledge sharing and cooperative work between people inside the organization.
- Disseminate the best practices in the company.
- Preserve past knowledge of the company so as to reuse it.
- Improve quality of projects and innovation.
- Improve relationships with external world (such as customers, or privileged partners).
- Anticipate evolution of the external environment (clients, competitors, etc.).
- Be ready to react to unexpected events and to manage urgency and crisis situations.

So a KM policy must rely on a deep understanding of what is the organization, what is its corporate culture, what kind of knowledge exists (either individual, or collective in an internal group or collective in the whole organization), how can the organization's intellectual capital be assessed, how can the past explain the present and help to prepare the future, what can be the strategic objectives of KM and how they can be achieved according to the corporate culture and the environment of the end-users.

In an organization, knowledge can be individual or collective, it can be explicit, implicit, or tacit. In Nonaka's model [50], organizational learning relies on transformation between these different types of knowledge. Collective knowledge can also emerge in a community of practice. Tacit knowledge can be transmitted without any language and external support (e.g. through observations), but in order to be transmitted to other persons, explicit knowledge generally needs a medium (i.e. document, database, etc.) so that people can create their own knowledge either by interacting with each other or by retrieving information from explicit traces and productions of other colleagues' knowledge. Knowledge can also be distributed among several knowledge sources in the organization, with possibly heterogeneous viewpoints.

There are three significant aspects to be tackled :

- People (i.e. their knowledge, their organizational functions, their interest centers, their knowledge networks, their work environment, etc.): any KM solution must be compatible with the end-users' cognitive models and work environment.

- Organization (i.e. its objectives, its business processes, the corporate culture, its corporate strategy, etc.): any KM solution must be compatible with the organizational strategy and culture.
- Information technologies for supporting the intended knowledge management: the chosen technologies will depend on the KM objectives and on the intended end-users' environment.

The strategic vision for KM must enable to select the priority among the needs in KM and to orientate the choice of relevant techniques. One possible approach for KM is the building of a corporate memory or organizational memory (OM). A corporate memory can be defined as an "explicit, disembodied, persistent representation of crucial knowledge and information in an organization, in order to facilitate their access, sharing and reuse by members of the organization, for their individual or collective tasks". So different scopes and grains are possible for an organizational memory. Its building can rely on the following steps [6]:

1. Detection of needs in corporate memory,
2. Construction of the corporate memory,
3. Diffusion of the corporate memory,
4. Use of the corporate memory,
5. Evaluation of the corporate memory,
6. Maintenance and evolution of the corporate memory.

An organizational memory can be modeled from several perspectives: for whom, why, what, how, when, who and where. It aims at delivering the right knowledge to the right person at the right time in the right format, in order to enable the right action / decision. Although KM is an issue in human resource management and enterprise organization beyond any specific technological issues, there are important aspects that can be supported or even enabled by intelligent information systems. Especially artificial intelligence (AI) and related fields provide solutions for parts of the overall KM problem. Several techniques can be adopted for the building of an OM. The choice of a solution depends on the type of organization, its needs, its culture and must take into account people, organization and technology.

Several research topics can be useful for OM design:

- Knowledge engineering and enterprise modeling techniques [40][52][44][43] can contribute to identification and analysis of a company's knowledge-intensive work processes (e.g. product design or strategic planning): the analysis of information flow and involved knowledge sources allows to identify shortcomings of business processes, and to specify requirements on potential IT support.
- In order to acquire implicit knowledge, knowledge engineering methods and techniques are useful, in particular concepts handled in knowledge engineering such as ontologies, tasks and problem-solving methods. Knowledge modeling can be needed. The degree of depth of required knowledge modeling can vary: a significant depth can be required if the organizational memory is materialized in a knowledge base, a shallow modeling is sufficient for building a simple competence map of the organization.
- Past experiments (e.g. lessons of past projects, past incidents, past successes or failures, etc.) can be represented in a case-based system [36]; case-based reasoning techniques can then be useful for retrieving them and reusing them for a new situation.
- Ontologies can be a component of a corporate memory so as to be explored by the corporate memory end-user; they can also be used for improving information retrieval about resources (such as documents or persons) constituting the memory if these resources are annotated w.r.t. the ontology. Such a use of ontology is close to the Semantic Web approach relying on metadata describing the semantic content of the Web resources, using ontologies [45][51]. This approach for a corporate memory is inspired of the Semantic Web and is called "corporate semantic web" by the Acacia team.

- Natural language processing (NLP) tools can be exploited for the construction or enrichment of such ontologies [37] or for building annotations on the resources constituting the corporate memory.
- KM in an organization requires abilities to manage disparate know-how and heterogeneous viewpoints, to make them accessible and suitable for adequate members of the organization. When the organizational knowledge is distributed on several experts and documents in different locations, an Intranet inside the organization and Web technologies can be a privileged means for acquisition, modeling, management of this distributed knowledge. Agent technologies and Semantic Web technologies are a privileged way to handle such a distributed memory. Moreover, CSCW [35] offers an interesting way to enhance collaborative work between persons through distributed memories.
- A specific kind of corporate memory is a project memory for preserving knowledge acquired during a project, for improving project management, for reusing past project experiences, design technical issues and lessons learned [6]. KM can rely on the business processes. This process-oriented vision of KM can lead to OM integrating workflow systems.
- A corporate memory can rely on a competence map, and techniques enabling expertise location are very useful for knowing who knows what in the company.

The Acacia approach relies on the analogy between the resources of a corporate memory and the resources of the Web. We consider that a corporate memory can be materialized in a corporate semantic web, that consists of [6]:

- resources (i.e. documents in XML, HTML or non Web-oriented formats, people, services, software, materials),
- ontologies (describing the conceptual vocabulary shared by the different communities of the organization),
- semantic annotations on these resources (i.e. on the document contents, on persons' skills, on the characteristics of the services/software/materials), these annotations using the conceptual vocabulary defined in ontologies.

The underlying research topics are:

- How can we build and make evolve each component (resource, ontology, annotation)?
- How can we build them semi-automatically through knowledge acquisition from textual sources?
- How can we take into account multiple viewpoints?
- How can agent technology enable to build, manage and use a distributed memory?
- How can we offer "intelligent", ontology-guided information retrieval or pro-active dissemination?
- How can we rely on use scenarios for needs detection and for stakeholder-centers evaluation?

4. Application Domains

4.1. Panorama

Key words: *Accidentology*, *Engineering*, *Aeronautics*, *Transportation*, *Automobile*, *Health*, *Biology*, *Oncology*, *Telecommunications*.

There are various application domains of the project: our work on technical memory or project memory has applications in engineering (aircraft industry and car industry). Our work on the knowledge servers also has applications in engineering, in the sector of telecommunications (for corporate memory, skills management and technological watch) and in the biomedical field. Accidentology for road safety was a privileged application domain of all our work. But many other fields are possible.

4.2. Transportation: Accidentology

We collaborated with INRETS for the modeling of knowledge of several experts in road accident analysis (psychological specialists in the driver's behavior, vehicle engineers, infrastructure engineers). This application of accidentology illustrates an example of (partial) corporate memory and moreover, served as concrete example for numerous works of the team: analysis of co-operation between experts during a collective problem resolution, analysis of explanatory dialogues, comparison between multiple expertise models via our MULTIKAT software, exploitation of CommonKADS method generic models, association of conceptual graphs to expertise documents via our CGKAT software, representation of the artificial agents associated to the experts and their COMMONKADS expertise models, exploitation of the C-VISTA model for the representation of multiple points of view of different experts. We developed the RESEDA system (Intranet Network for Detailed Study of Accidents) in XML and JAVA, in order to support INRETS for road accident analysis.

4.3. Transportation and Engineering: Automobile

In the context of the improvement of the vehicle design process control, we collaborated with Renault to develop a memory of problems encountered during vehicle projects, whose traces were stored in the corporate information system. The construction of this project memory relied on techniques of knowledge engineering and of linguistic analysis. SAMOVAR system can be considered as a concrete example of corporate semantic Web.

4.4. Telecommunications

Our work on corporate memory, in particular the use of intelligent agents, ontologies and XML technology, is of particular interest for the companies of the telecommunications sector, as testifies our collaboration with T-NOVA (Deutsche Telekom) and CSELT (Italian Telecom) in the framework of the CoMMA IST project. T-NOVA applied this work for the assistance to insertion of new employees and CSELT for the assistance to technological monitoring. In addition, we collaborate with Telecom Valley and the GET (ENST and ENST-Bretagne) for our work on skills management. We also collaborate with ENST-Bretagne for the CNRS Specific Action on "Semantic Web and E-learning".

4.5. Civil Engineering Sector

Our work on corporate memory, in particular the use of intelligent agents, ontologies and XML technology, is also interesting for the construction industry: we thus collaborated with the CSTB within the framework of the CoMMA project for a scenario of technological watch.

4.6. Biomedical Domain

Our work on corporate memory, in particular our corporate semantic Web approach (ontologies and XML technology), is applied in several biomedical applications: use of linguistic techniques for building a experiment memory for transcriptome analysis (in the framework of the MEAT project in collaboration with IPMC), use of a medical ontology, viewpoints and CSCW for supporting collaborative work in a health care network (in the context of the ACI *Ligne de Vie* project in collaboration with the SARL Nautilus and SPIM (Service de Santé Publique et d'Informatique médicale de la Faculté de Médecine Broussais-Hôtel Dieu).

5. Software

5.1. CORESE

Key words: *Information Retrieval*, *World Wide Web*, *XML*, *RDF*, *RDFS*, *RDF Schema*, *Conceptual Graph*, *ontologies*.

Participants: Olivier Corby [correspondant], Olivier Savoie, Francis Avnaim.

5.1.1. Description.

CORESE (COnceptual REsource Search Engine) is an RDF(S)-dedicated engine based on conceptual graphs. It enables to load RDFS schemas and RDF annotations and to transform them into conceptual graph formalism. It then enables to query the base of annotations thus created, by using the projection operator offered by the conceptual graph formalism. The result obtained is translated into RDF to be returned back in response to the request.

CORESE takes benefits of an INRIA operation of software development (ODL) intended to improve quality of the implementation in order to support its diffusion.

http://www-sop.inria.fr/acacia/soft/corese

5.1.2. Applications.

CORESE is used as search engine:

- for the KMP project on skills management with Telecom Valley,
- in the *Ligne de Vie* project on health care network,
- in the MEAT project on experiment memory on transcriptome analysis,
- in our recent co-operation launched with EADS.

CORESE was the cornerstone of four co-operations of the Acacia team:

- the IST project, CoMMA (Corporate Memory Management through Agents) [46],[11][22],
- the SAMOVAR project with Renault [13], [49][48],
- the co-operative research action ESCRIRE [28][29][20],
- the Color action Aprobatiom with CSTB.

5.1.3. Diffusion.

- CORESE was registered at APP.
- CORESE was made available to:
  - Renault,
  - ATOS Origin,
  - T-Systems NOVA (Deutsche Telekom),
  - CSTB,
  - CSELT (Telecom Italia),
  - LIRMM,
  - Mainline team at ESSI,
  - CETU (Centre d'étude des tunnels du Ministère de l'Equipement).
  - University of Santiago Chili,
  - ENST Bretagne,
  - UTC Troyes,
  - Facultad de Informatica, LSIIS
  - Zuhlke Engineering AG, CH
  - W3C Group on the Social Meaning of RDF Graphs, Deltek Systems, Inc. USA
  - CETU

- In 2003, CORESE was presented in demonstration to:
  - EADS,
  - Schneider,
  - Tech Cico team of UTT Troyes,
  - ENST Bretagne,
  - Steering committee of the KMP project at Sophia Antipolis,
  - University of Santiago in Chili, Detartment of Economic Sciences,
  - The first Workshop of the Colors and CNRS Specific Action WebLearn.
- The work on CORESE was published in [2][3].

5.2. MULTIKAT

Participants: Stefan Hug, Rose Dieng-Kuntz [correspondante].

Key words: *Knowledge Acquisition*, *Knowledge Capitalization*, *Corporate Memory*, *Co-operation*, *Multiexpertise*, *Ontology*.

5.2.1. Description.

MULTIKAT is a tool enabling to compare knowledge of several experts automatically, when such knowledge is represented in Sowa's conceptual graph formalism. When modeling the expertise of several experts, one must take into account the expertise conflicts intervening between the expertise models of the various experts, in order to establish their common expertise model. This expertise model can be represented by using Sowa's conceptual graph formalism.

MULTIKAT allows the management of conflicts during modeling of knowledge of several experts: this tool implements an algorithm of comparison and integration of several conceptual graphs corresponding to various viewpoints, the integration being guided by various strategies of integration.

MULTIKAT can be applied to the comparison of ontologies when they are described in conceptual graph formalism.

MULTIKAT is implemented in C/C++ and JAVA, above the conceptual graph platform, COGITO (developed by the LIRMM).

MULTIKAT was registered to the APP and was applied in accidentology.

MULTIKAT was published in [9], [41].

5.3. RESEDA

Key words: *Accidentology*, *XML*, *Knowledge Base*.

Participants: Guillaume Blanc, Antoine Tobo, Patrick Itey [correspondant], Olivier Corby.

5.3.1. Description.

The software RESEDA is a system of assistance to the road accident analysis. It aims at enabling the investigators of INRETS-Salon-de-Provence to fill out computerized accident files, with an intelligent support. According to data seized on the accident, RESEDA exploits a knowledge base (described in XML format) in order to provide the user with suggestions useful for his task of accident analysis. These suggestions come from a knowledge base which was built through acquisition and modeling of knowledge of the INRETS experts. RESEDA also uses a base of generic scenarios (written in XML format) in order to suggest the most plausible generic scenarios, applicable for the reconstitution of the current accident analyzed by the user. RESEDA illustrates an application of knowledge engineering and exploits XML technology [6].

5.3.2. Applications.

RESEDA was developed for an application of accidentology, but could be exploited for a memory composed of medical records, of incident forms or of project forms.

6. New Results

6.1. Support to Modelling and Building of a Corporate Memory

Key words: *Corporate Memory*, *Cognitive Sciences*, *Knowledge Acquisition*, *Knowledge Capitalization*, *Knowledge Management*, *Knowledge Engineering*, *Ontology*, *Assistance to the User*, *Cognitive Psychology*, *Communication*, *Co-operation*.

The objective of this action is to propose methodological and software support for the construction of a corporate memory, thanks to a user-centered approach. We study in particular the construction of a corporate semantic Web and the construction of ontologies from human and textual sources of expertise.

6.1.1. Methodology for Construction of a Corporate Semantic Web

Participant: Rose Dieng-Kuntz.

Key words: *Knowledge Capitalization*, *Knowledge Management*, *Corporate Memory*, *Project Memory*.

By taking into account the analogy between the resources of a corporate memory and the resources of the Web, a corporate memory can be materialized in a corporate semantic web, that consists of:

- resources (i.e. documents in XML, HTML or non Web-oriented formats, people, services, software, materials),
- ontologies (describing the conceptual vocabulary shared by the different communities of the organization),
- semantic annotations on these resources (i.e. on the document contents, on persons' skills, on the characteristics of the services/software/materials), these annotations using the conceptual vocabulary defined in ontologies.

An organization can be an actual enterprise, a community, a virtual enterprise consisting of several organizations in collaboration. Our methodology for building a corporate semantic Web is summarized in [42].

6.1.2. Adapting Models from Human and Social Sciences to the Design of Organizational Memory Systems

Participant: Alain Giboin.

This action aims at adapting models from human and social sciences, esp. psychological models (cf. [39][38]), the design of organizational memory systems, these models serving as frames to understand actual practices of organization members, to elicit system specifications, to elaborate system architectures, or to evaluate the systems and their use. Model adaptation rests on various analyzes of actual practices observed within the organizations involved in the team research contracts.

We continued our study of the dialogical approaches to organizational memory system design, by focusing on the processes of producing and understanding/using the documents which partly compose the organizational memory, e.g., instructions and procedures of work. We considered such documents as instruments for a delayed or asynchronous dialogue between present, past, and future members of an organization, a design team, and so on [27]; for example, a document describing a work procedure can be seen as a prop for an asynchronous dialogue between some retired employee and a new employee hired in the same departement. This view of organizational or professional documents allows to explicit the coordination processes between

writers and readers/users of documents, as well as the practices (techniques, devices, etc.) used to facilitate these coordination processes. This explicitation informs system design.

6.1.3. Adapting the Scenario Method to the Design and Evaluation of Organizational Memory Systems

Participant: Alain Giboin.

This action aims at adapting the scenario method used by the HCI (Human-Computer Interaction) and CSCW (Computer-Supported Cooperative Work) communities to the design of organizational memory systems. The purpose of this adaptation is mainly to allow us to design user interfaces adapted to the users and to the usage context of our systems, and to make these interfaces more flexible.

We continued our study of the scenario method by reviewing variants of this method, and connected methods (vignettes, storyboards, personas, etc.), and idenfying the various forms in which the partners of a design project (user, requirements analyst, designer, developper, tester, etc.) apprehend scenarios, and how partners can pass from a form to another without losing sight of the usage aspects which motivate the design.

6.1.4. Construction of a multi-point of view Semantic Web

Participants: Thanh-Le Bach, Rose Dieng-Kuntz.

Keywords: Semantic Web, Ontology, Ontology Matching, Viewpoints.

The work is carried out within the context of Thanh-Le Bach' s PhD.

The objective of this thesis is to allow to construct and exploit a semantic web in a heterogeneous organization, comprising various sources of knowledge and various categories of users.

In the framework of knowledge management in a heterogeneous organization, the materialization of the organizational memory in a corporate semantic web may require to integrate the various ontologies of the different groups (or communities) of this organization: the various communities generally prefer to use their own ontologies instead of a common general one.

To be able to build a corporate semantic web in a heterogeneous, multi-communities organization, it is essential to have methods for manipulating the different ontologies of the various groups of the organization, for comparing, aligning, integrating or mapping these different ontologies.

We first studied the state of the art on semantic web languages such as RDF(S), DAML+OIL, OWL and on algorithms of ontology matching. We then proposed an algorithm, named ASCO, for matching two ontologies. The algorithm is based on previous work, it finds mappings in a 2-phase process: the linguistic phase and the structural phase. In the first phase, the similarity value between two elements (such as concepts or relations) from two ontologies is calculated from their available different information: their names (which defines what the concept or the relation is), their labels (which provides a human-readable version of the name of the concept or the relation), and their descriptions. The linguistic similarity value calculation is performed in several ways, such as string-distance metrics, TF/IDF. To improve the accuracy of the calculation, we integrated WordNet, a lexical reference system, to exploit the synonym relations, hypernym relations between terms. The second phase, the structural phase, exploits the taxonomic information in the structures of the ontologies. It uses the heuristic information and domain knowledge to calculate structural similarity values between elements of two ontologies. The similarity values in two phases are combined to obtain final similarity values between elements. Based on these values, mappings are deduced.

The algorithm was tested and evaluated with two real-world ontologies: O'COMMA, which has 472 concepts and 77 relations; and O'Aprobatiom, which has 460 concepts and 92 relations. O'COMMA is a corporate memory-dedicated ontology, which was developed for the CoMMA IST project (2000-2001) [47]. O'Aprobatiom is an ontology dedicated to project memory in building domain, that was developed through a cooperation between our team ACACIA and CSTB.

As a further work, we will continue to test our algorithm on the other real-world ontologies, especially in the medical domain, and extend the algorithm to improve the results.

The mapping algorithm between ontologies can be applicable in several domains in the semantic web where the ontology is crucial and the number of ontologies is more and more abundant, where new ontology-based knowledge management systems will be created.

6.1.5. Ontologies and Semantic Relation Acquisition from Biomedical Corpora

Participants: Laurent Alamarguy, Rose Dieng-Kuntz.

Key words: *Ontology*, *Semantic Relations*, *Lexical Semantics*, *Corpus-based Knowledge Acquisition*, *NLP*, *XML*, *RDF*, *Semantic Web*, *Biomedical domain*.

This work is performed in the framework of Laurent Alamarguy's PhD thesis. It aims at elaborating methodological support and tools for the automation of corpus-based ontology construction or enrichment in order to develop a community memory in biomedical area.

Nowadays, in biomedical research area, discovering as automatically as possible some correlation between diseases and genes embodies a kind of quest for the holy grail. Indeed, we plan to use the CORESE inference engine to build up accurate genetic implications in central nervous system diseases from data available through the web. This semantic engine, developed in a Semantic Web perspective, relies on ontologies and annotations on Web resources. So to enhance the automation of this knowledge acquisition, Natural Language Processing may play a major role by developing linguistic methods to analyze textual data.

First of all, we are focusing on the acquisition of semantic relations underlying gene implications in central nervous system diseases. So the first stage has been devoted to the corpus analysis and the extraction of domain expressions. We have worked on two corpora: they are respectively constituted by about 5100 Medline abstracts and about 250 Medline abstracts, and they deal with gene correlation on SNC diseases and with actors in health care networks. Moreover, we studied various extraction methods following different tools (Nomino, Fastr). We also pay attention to comparison between linguistic and statistical methods devoted to relation acquisition. While improving state of the art on biomedical ontologies and on knowledge acquisition methods, we have sketched a corpus-based ontology learning methods and we also consider reusing well-advanced tools in biomedical knowledge management such as MetaMap.

6.1.6. Corporate Memory and Semantic Web for the Transcriptome Analysis

Participants: Khaled Khelif, Rose Dieng-Kuntz.

Key words: *Corporate memory*, *semantic web*, *NLP*, *DNA micro-array experiments*, *ontology*, *semantic annotations*.

This work is carried out in the context of Khaled Khelif's thesis.

The study of gene expression has been greatly facilitated by DNA micro-array technology. DNA micro-arrays measure the expression of thousands of genes simultaneously, which helps biologists to define gene functions and their effects on organisms.

The goal of this work is to assist biologists working on DNA micro-array experiments in the validation and the interpretation of their results.

Our aim is to propose a method for the capitalization and the valorization of knowledge resulting from the biologists' experiments (semantic annotations, ontology) a software architecture to preserve and reuse results of the experiments (structured documents, information retrieval). We rely on the techniques of semantic web and knowledge engineering.

Initially, in order to delimit and to define the problem, we made a state of the art on DNA micro-array experiments. Then, we focused on the approaches of knowledge acquisition from texts and we compared some statistical and linguistic tools of natural language processing (NLP) in order to propose a method for enrichment by concepts and relationships of existing bio-medical ontologies like Gene Ontology or UMLS. This new ontology will be used, for the automation of annotation of documents (papers, experiment reports) and as an input for CORESE to facilitate information retrieval.

To test different NLP tools (Nomino, Likes, Syntex), we relied on a collection of texts, chosen and manually annotated by members of the IPMC team working on micro-array experiments.

6.2. Information Retrieval in a Corporate Semantic Web

Key words: *Knowledge Acquisition*, *Knowledge Engineering*, *Knowledge Management*, *Corporate Memory*, *Programming Environment Knowledge Server*, *World Wide Web*, *Semantic Web*, *XML*, *RDF*, *Conceptual Graph*, *Ontology*, *Information Retrieval*.

We study the problems involved in the dissemination of knowledge through a knowledge server via Intranet or Internet: we consider the Web, and in particular the semantic Web, as a privileged means for the assistance to management of knowledge distributed within a firm or between firms. A knowledge server allows the search for information in a heterogeneous corporate memory, this research being intelligently guided by knowledge models or ontologies. It also allows the proactive dissemination of information by intelligent agents. We look further into the case of a memory materialized in the form of a corporate semantic Web, i.e. in the form of resources (such as documents) semantically annotated by RDF statements relating to an ontology.

6.2.1. Corese Semantic Search Engine

Participants: Olivier Savoie, Olivier Corby [correspondant], Francis Avnaim.

Key words: *Knowledge Acquisition*, *Knowledge Engineering*, *Knowledge Management*, *Corporate Memory*, *Programming Environment Knowledge Server*, *Semantic Web*, *XML*, *RDF*, *CommonKADS*, *Conceptual Graph*, *Ontology*, *Information Retrieval*.

The Corese ODL (Software Development Operation) aims at increasing the impact and the diffusion of Corese. In this purpose, the ACACIA team wants to develop the quality of the Corese architecture (modularity, documentation, test, evolution,...), the quality of the application programming interface (API) and the quality of the global usability of the software.

The ODL began in June 2002 for two years.

- First of all, we worked on developments concerning the engineering of the architecture, the modularity and the usability, which lead to the current version.
  - Until summer 2002, RDF literals did not have datatypes. A specification proposal has been included in the W3C Last Call for RDF. Following this specification, we implemented a Corese datatype package. We implemented it following a precise problematic:
    * We integrated datatypes in Corese data model: we integrated the datatype hierarchy in the already existing concept type hierarchy. We integrated datatypes into graph nodes (concepts). We created classes of objects that inherit from generic datatype interfaces.
    * We manage datatypes with non null value space intersection (i.e. number, integer, float,...).
    * We can easily configure Corese by a declarative mapping between a datatype name and a Java datatype class.
    * We manage datatypes generically: based on the previous mapping, we used Java introspection to create and then consider a datatype object depending on the operation to process on it (regular expression, string operation,...). We implemented the polymorphism for datatypes.
    * To be efficient, we added several optimizations, to speed up the datatype operations.
  - In order to be compliant with most software architectures, Corese should be deployable as a Java Web component. We developed a separate web component using Java Serlet and JSP components. We took inspiration from several frameworks that propose a Model-View-Controller architecture. It facilitates additions of new web forms for Corese users. This component is independent of the Corese engine so as to preserve modularity.

- Concerning the diffusion we increased the quality of the packaging:
  - Installation is easier (Decompression of an archive). The package contains the standalone version but the web version too.
  - A well documented installation file is delivered.
  - We added global parameters to Corese. These parameters follow the Java CLASSPATH parameter mechanism. Corese users can now parameter their own ontology, annotations location to be loaded by Corese. We implemented, following the Java model, a DataLoader class (equivalent to the Java class Loader) that is in charge of static resource loading.
  - We tested it all by helping the integration of Corese in the KMP project platform.

We have been working on leveraging Corese towards RDF semantics evolution, in particular, in order to take into account literals with language tag and XML Schema datatypes.
We have developed:

- optimizations coming from constraint programming to optimize projection : enumerations, arc coherence (thanks to Gilles Trombettoni from Coprin)
- optimization of query processor (Francis Avnaim)
- constraint processing on the fly (Francis Avnaim).

The query processor has been extended :
An extension of the projection is proposed with path of length greater than one, bound by an integer :
x R (3) y ::= x R y OR x R t R y OR x R t1 R t2 R y.
After query, it is possible to group results as in the SQL *"group by"*, and to count results :

- *group by concepts*: group results that share the same binding of concepts
- *group by connected concepts*: group results if there is a not null intersection in the binding. This enables to compute equivalence classes by combining a projection including an equivalence relation and a connected *"group by"* on the arguments of the equivalence relation.
- *Count the number of occurrences of different concepts after grouping*, for example : group by competence and then count firms.

We have introduced some statements from OWL :

- owl:TransitiveProperty, owl:SymmetricProperty
- owl:inverseOf, owl:intersectionOf.

A first distribution version of Corese is available for download on the Corese web page: http://www-sop.inria.fr/acacia/soft/corese.
A first prototype of semantic web server built on top of Corese is available.

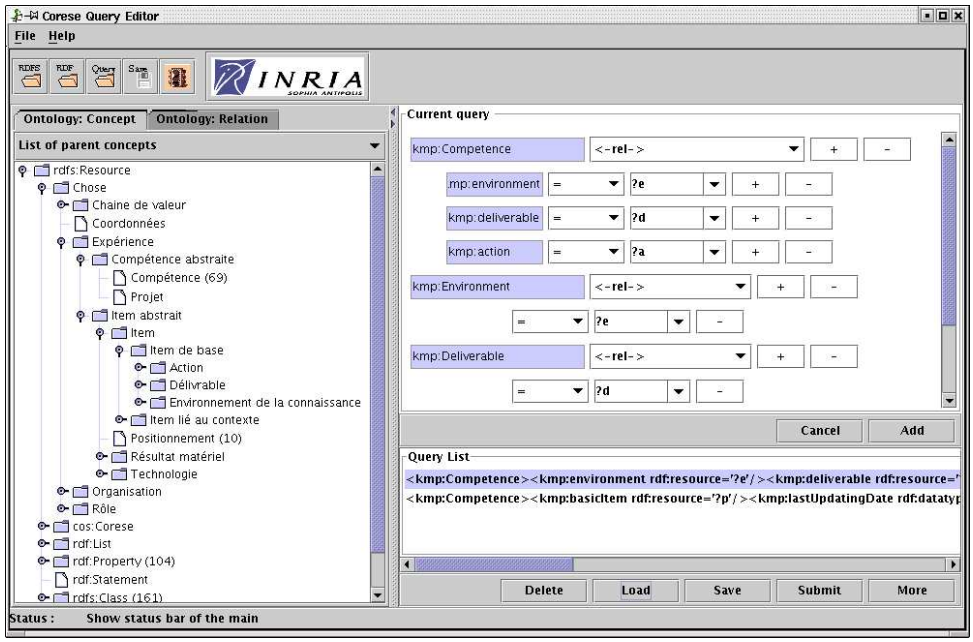

Figure 1. Corese

6.2.2. Adaptation of Corese for KMP

For the KMP project, we have designed a generic model of computation of equivalence classes among resources described in RDF. The KMP project needs to compute sets of equivalent competences which are composite objects. We define an equivalence relation, called similar. The relation extension is computed by inference rules that encode the conditions under which competences are equivalent. i.e. competences are equivalent if their components (action, environment, deliverable) are members of the same ontology subtree.

Then, we compute the equivalent competences by projection. Eventually, we compute the equivalence classes of equivalent classes with a new operator: the connected join which computes connected components of the equivalence relation.

6.2.3. Ontology-Guided Information Retrieval

Participants: Carolina Medina-Ramírez, Rose Dieng-Kuntz.

Key words: *Conceptual Graph*, *XML*, *RDF*, *Semantic Web*, *Information Retrieval*.

This work was carried out in the framework of Carolina Medina-Ramírez's PhD [28][29][20].

The goal of this thesis was to give not only a translation process from languages using different semantic levels but also an environment for managing, capitalizing and distributing knowledge into an information retrieval framework.

The main contributions of this thesis concern three aspects: document semantic retrieval, documentary memory and conceptual graphs. In particular, for semantic document retrieval, we have proposed:

1. A method to translate an ontology, annotations and queries represented in a pivot language towards the conceptual graphs while passing by an intermediate translation into RDF(S). This method is formalized by a translation regular grammar: Escrire -> RDF(S) -> CG.
2. A base of inference rules for exploiting tacit knowledge underlying the Medline scientific abstracts that composed the test corpus.

For representing, handling, diffusing and querying a documentary memory, we have proposed :

1. A knowledge server called *EsCorServer* allowing to retrieve documents from a documentary memory of gene interactions by a sequence of operations such as the normalization of queries, the filtering of information, the inference rules and the creation of virtual documents. We have used CORESE for the information retrieval.
2. A method to create virtual documents in order to complete the results obtained from a request. This method exploits the query given by the user of ESCORSERVER and the annotations (possibly in various formats) available in the documentary memory.

For Conceptual graphs we have proposed :

1. Algorithms to handle disjunction and negation in conceptual graphs queries.

6.2.4. Software Agents for Web Mining: Application to Technological and Scientific Watch

Participants: Tuan-Dung Cao, Rose Dieng-Kuntz.

Keywords : Multi agent system, Corporate memory, semantic web, web mining, ontology, semantic annotations, technological watch.

This work was performed in the context of the thesis of Tuan-Dung Cao.

The huge amount of information now available on line and accessible through the Web can be used for the technological and scientific watch of an enterprise. For knowledge management purposes in an organization or a community (especially, for technological or strategic watch), Web mining techniques can be particularly useful for discovering relevant information in the Web.

The objective of the thesis is to exploit agent technology to develop a multiagent system, these agents being guided by ontologies, to collect, capture, filter, classify and structure the contents of the Web coming from several sources of information, in a scenario of assistance to the technology watch at the CSTB (Center of Science and Technology for Building).

Initially, to delimit and to define the problem we studied the state of the art on multi-agent system, web mining, semantic web (XML, RDF(S), ontologies). This analysis enabled us to analyze the task of monitoring which is currently carried out by the documentalists of the CSTB and to understand the current monitoring system and the monitoring process including: phases, actors, types of information sources... We tried to identify where ontologies and agents could intervene and to propose a description of this task, by relying on Lesca's monitoring model. It will help us to choose a relevant scenario of monitoring and to build ontologies, which will guide the information search and extraction.

Then, we will propose a multi-agents architecture allowing to distribute the work of Web mining between several cooperating software agents, including "wrappers" on the sources of information in order to produce semi-automatically semantic annotation bases: we will offer an extension of our previous work [25][26]. These annotations could then be exploited by agents in semantic search as in [22].

6.2.5. Semantic Web Technologies for a Health Care Network

Participants: David Minier, Frédéric Corby, Rose Dieng-Kuntz, Olivier Corby, Phuc-Hiep Luong, Laurent Alamarguy.

This work was performed in the framework of the Ligne de Vie project (detailed in section 7.2) and in the framework of the trainings of Frédéric Corby, Phuc-Hiep Luong and David Minier. The ACI *Ligne de Vie* project objective is to develop a knowledge management system for a health care network, so as to ensure care continuity and support to collaborative work of the actors of the network.

Our contribution consisted of:

- *Translation of a medical database (Nautilus) into a structured ontology, represented in RDF(S) and enabling to browse this ontology through Corese and thus check its consistency* (Frédéric Corby,

Olivier Corby, David Minier) [31][34]. This approach is interesting for a company having a database available and wishing to extract from this database the elements enabling to build a structured ontology, represented in a semantic Web standard language such as RDFS.

- *Method for enriching this medical ontology*, by relying on the candidate terms extracted by a linguistic tool applied on a corpus of texts on healthcare networks (David Minier, Laurent Alamarguy, Rose Dieng-Kuntz).
- *Method for creating (possibly multi-viewpoints) annotations* (David Minier, Rose Dieng-Kuntz).
  We studied the various possibilities to conceptualize the notion of point of view: for the ontology's developer, for an XML document creator and for the user. We studied how to build a base of annotations on the documents associated with such a XML document: these annotations will enable for example to specify the type of a document, as well as medical user's comments, with various levels of confidentiality and possibly according to various points of focus and view angles, etc. We showed how to represent these annotations in RDF and how to use them with CORESE to get information relevant for the different categories of users. We applied this work in the framework of healthcare networks.
- *Specifications and implementation of a collaborative tool (virtual staff)* (Rose Dieng-Kuntz, David Minier, Phuc-Hiep Luong, Olivier Corby).
  We have proposed a first specification of a collaborative tool, called "Virtual Staff", enabling to visualize the reasoning of the actors of a health care network for complex diagnostic and therapeutic decisions. This tool will rely on conceptual graphs with certainty degrees. We studied how to express certainty degrees in fuzzy conceptual graphs and in fuzzy RDF(S). We also studied how such graphs can be represented in the SOAP model (Subjective, Objective, Assessment, Plan) used by the medical community and in the QOC model (Question, Option, Criteria) used in CSCW community. Presently, we are programming the Virtual Staff with Java language.

6.2.6. Fuzzy Conceptual Graphs and Fuzzy RDF(S)

Participants: Phuc-Hiep Luong, Rose Dieng-Kuntz, Olivier Corby.

This work was carried out in the context of Phuc-Hiep Luong's DEPA final internship [33].

The current World Wide Web is showing its limitations with the explosion of information over the Internet. Many Knowledge Representation formalisms have been applied to exploit contents of Web resources and better reason on them. Conceptual Graphs (CGs) and RDF(S) language have shown limitations in expressing imprecise and uncertain information. We studied several extensions of these knowledge representation formalisms with purpose of providing a flexible expressivity. With the extended Fuzzy Conceptual Graphs and Fuzzy RDF(S) obtained by combination of fuzzy concepts and fuzzy set, Web documents can be interpreted in a way similar to human expressions and arguments. With the aim of providing a flexible expressivity, we need a way of representation with a degree of certainty by fuzzy set and fuzzy logic for reasoning. Relying on this idea, we have studied Fuzzy Conceptual Graphs and proposed an extension of RDF(S) with certainty degrees. This study was realized in the framework of the ACI *Ligne de Vie* project (see section 7.2) that aims at the development of an online system for managing patient's healthcare documents.

7. Contracts and Grants with Industry

7.1. Knowledge Management Platform

Participants: Olivier Corby (co-resp.), Karine Delêtre, Alain Giboin (co-resp.), Nicolas Gronnier, Cécile Guigard, Olivier Savoie.

The RNRT project KMP (Knowledge Management Platform) is a pluridisciplinary project, which involves teams specialized in computer science, economic sciences, management sciences, ergonomics and psychology,

namely: Laboratoire Rodige (UNSA-CNRS), Laboratoire Latapses (UNSA-CNRS), Acacia Team (INRIA Sophia Antipolis), GET (Telecom Paris and ENST Bretagne), Telecom Valley Association (Sophia Antipolis). The application goal of KMP is to construct a web service facilitating the sharing of competences within a community - the Telecom Valley (Sophia Antipolis) - which gathers firms, local institutions, and academic organizations working in the telecommunications domain. The aim of KMP is to promote parternship seeking and setting within the community [30].

The Acacia Team coordinates sub-projects 1 and 3 of the KMP project (1| building an ontology to represent competences; 3| implementing a web service prototype for competence management), in collaboration with Rodige and ENST Bretagne, together with pilot users of KMP. Hence KMP is a use(r)-oriented co-design project. Several actions were undertaken this year, leading to a first version of the KMP prototype, mainly based on Corese, the Acacian semantic search engine:

- *Building of ontologies for describing and seeking for competences*: building of a minimal KMP ontology operable by Corese; extensions to the minimal ontology (esp., ontology of information and communication technologies).
- *Construction of a software tool for collecting and analyzing data related to the competences of the organizations*. This tool was firstly aimed at the KMP operational team. Later on, once adapted to KMP pilot users, the tool served as a prototype of a competence editor for pilot users. This prototype has been made accessible to KMP pilot users via internet, thanks to the installation of a hosting server (hardware provided by Compaq-HP, one of pilot user of KMP).
- *Construction of KMP prototype 1 (competence search and identification functionalities)*: specification of functionalities, interface (esp. map interface) mock-up, implementation based on Corese (after adaptations to this engine) and using SVG (for map interfaces).
- *Analysis and specification of CSCW functionalities for prototype 2* [32].

7.2. Ligne de Vie

Participants: Laurent Alamarguy, Frédéric Corby, Olivier Corby, Rose Dieng-Kuntz (resp.), Phuc-Hiep Luong, David Minier.

Key words: *Ontology*, *Knowledge Management*, *Semantic Web*, *XML*, *RDF*, *Health Care Network*.

The ACI *Ligne de Vie* project in collaboration with the SARL Nautilus and SPIM (Service de Santé Publique et d'Informatique médicale de la Faculté de Médecine Broussais-Hôtel Dieu) aims at building a knowledge management tool for a health care network, so as to ensure continuity of healthcares and co-operative work in such a health care network. The Acacia team had the following contributions [34]:

- *State of the art*
  We made an analysis of the needs in a health care network by relying on literature and discussions with medical actors (a doctor of Lenval Hospital and a nurse). We also made a state of the art on medical ontologies.
- *Extensions of Nautilus ontology*
  The Nautilus medical ontology is in fact a database and currently contains a nomenclature (the lexicon). The lexicon terms are connected with relations such as "is a", "is situated on" and "is measured by". In addition to the medical terms already present in Nautilus ontology, we extended this ontology with concepts useful for healthcare networks (for example, concepts on various types of network, on actors, on documents) and we linked them to the other concepts already existing. This extension partially relied on the analysis of the candidate terms extracted by a linguistic tool applied on a corpus of texts on healthcare networks.
  In order to rely on a semantic Web standard, we translated the Nautilus Ontology from the database format into RDF. We wrote a program in Java which can take the files of Nautilus and transform them into a RDF code [31].

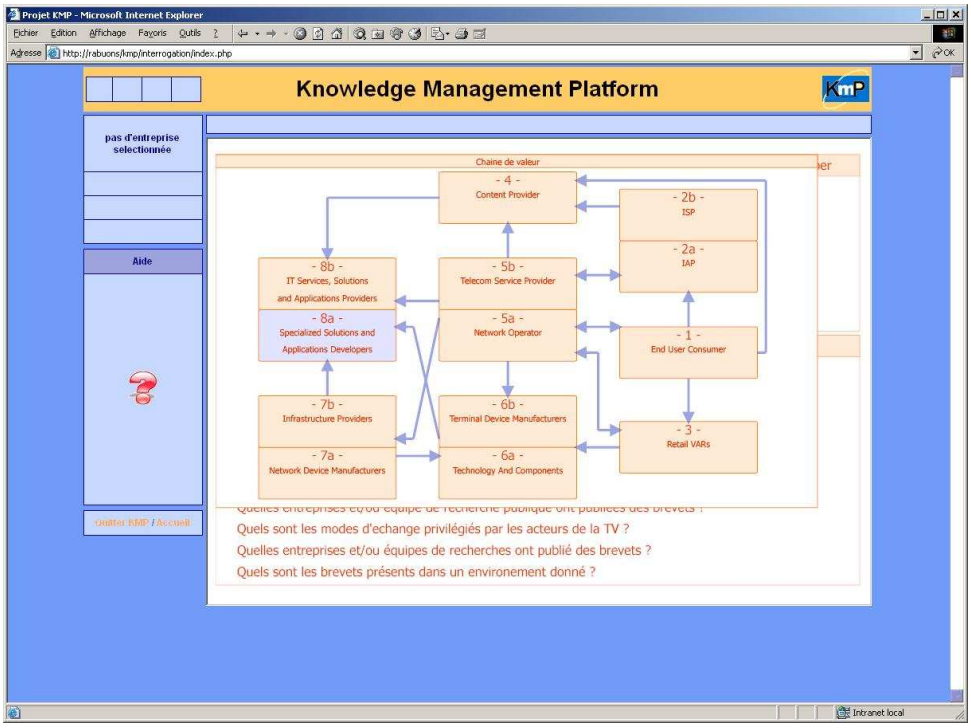

Figure 2. KMP

- *Construction of (possibly multi-viewpoints) annotations*
  We studied the various possibilities to conceptualize the notion of point of view: for the ontology's developer, for the patient's dossier developer and for the user. We studied how to build a base of annotations on the documents associated with the patient's life line: these annotations will enable for example to specify the type of a document, as well as medical comments, with various levels of confidentiality and possibly according to various points of focus and view angles, etc. We showed how to represent these annotations in RDF and how to use them with CORESE to get information relevant for healthcare networks.
- *Specifications and implementation of Virtual Staff*
  We have proposed a first specification of the future collaborative tool "Virtual Staff". This tool should be able to represent diagnotic and therapeutic assumptions with a conceptual graph using the vocabulary defined in Nautilus ontology. We study how such graphs can be represented in the SOAP model (Subjective, Objective, Assessment, Plan) used by the medical community and in the QOC model (Option, Question, Criteria) used in CSCW community. Presently, we are programming the Virtual Staff with Java language.

7.3. EADS

Participants: Olivier Corby (resp.), Rose Dieng-Kuntz.

Key words: *Ontology*, *Knowledge Management*, *Semantic Web*, *XML*, *RDF*, *Spatial domain*.

We recently started a collaboration with EADS for evaluating a CORESE-based semantic Web architecture, for semantic annotations on EADS documents and intelligent information retrieval from them.

8. Other Grants and Activities

8.1. Regional Actions

8.1.1. MEAT Project

Participants: Khaled Khelif, Rose Dieng-Kuntz (resp.), Olivier Corby, Alain Giboin.

We collaborate with Pascal Barbry (IPMC) and Rémi Bars (Bayer Crop Science) to build a memory of experiments on DNA chips (see section 6.1.6).

8.1.2. Laboratoire des usages de Sophia Antipolis

The Acacia team participates in the Laboratoire des usages of Sophia Antipolis through the RNRT project KMP. The laboratory was created on the initiative of the Centre national de recherche technologique (CNRT) of Sophia Antipolis. INRIA Sophia is a founder member of this laboratory. The laboratory aims at observing the current collective usages of technologies, and to anticipate future usages « by a pluridisciplinary research gathering technologists, economists, sociologists, ergonomists, marketing specialists with rigorous methodologies around effective technological platforms and relevant and various users. »

8.1.3. CSTB (French Scientific Center for Building Physics)

Participants: Tuan-Dung Cao, Rose Dieng-Kuntz (resp.).

We collaborate with Bruno Fiès and Marc Bourdeau (CSTB) for Tuan-Dung Cao's PhD on *Software Agents for the Web Mining, Application to Technological and Scientific Watch*.

8.1.4. CINDY, Pôle Cindyniques of ENSMP

Participants: Thanh-Le Bach, Rose Dieng-Kuntz (resp.).

We collaborate with Franck Guarnieri (CINDY at ENSMP) for Thanh-Le Bach's PhD on *Construction of a multi-viewpoint Semantic Web*. CINDY refers to the Pole of Research and Formation on Danger and Risk Management of the École Nationale Supérieure des Mines de Paris, in Sophia Antipolis.

8.1.5. WebLearn Colors

Participants: Rose Dieng-Kuntz (resp.), Olivier Corby, Alain Giboin, Catherine Faron-Zucker.

We collaborate with the Mainline Team at ESSI, the LIRMM, and the CREGO for the WebLearn Colors on *Semantic Web for E-Learning*. Our objective is to explore the techniques of the Semantic Web for e-learning applications and to measure the impact of e-learning specificities for the design of dedicated semantic portals.

8.2. National Actions

8.2.1. WebLearn CNRS Specific Action

Related to the local WebLearn Colors (see above) is the national CNRS Specific Action (SA) on *Semantic Web for E-Learning* to which we participate also. Rose Dieng-Kuntz, Monique GrandBastien (LORIA) and Danièle Hérin (LIRMM) co-ordinate this SA. In addition to the local teams involved in the WebLearn Colors, the WebLearn SA involve UTC, LORIA, Pau University, and ENST Bretagne.

8.2.2. Syntax Action

We take part in Syntax, an INRIA national research and development action on electronic documents. Acacia contribution consists in participating to the integration of the RDF formalism into the syntax platform and to study the possibility of integrating the Corese semantic search engine.

8.2.3. Working Groups

Members of the Acacia team take part in several working groups:

- Olivier Corby took part in the CNRS Specific Action on *"Semantic Web"* http://www.lalic.paris4.sorbonne.fr/stic/.

- Rose Dieng-Kuntz is member of:
  - the board of the GRACQ (*Groupe de Recherche en Acquisition des Connaissances*) (http://www.irit.fr/GRACQ).
  - the TIA Group (*Terminology and AI*).
  - the CNRS Specific Action, ASSTICCOT, on *Terminology and corpus* (http://www.irit.fr/ASSTICCOT/).
  - the COOP Group (*Acquisition et modélisation des connaissances pour un système d'assistance coopératif*).
- Alain Giboin is member of:
  - the COOP Group,
  - the Group « Psychologie ergonomique » of the Département Recherche de la Société française de Psychologie. Founder member and member of the board of this group, he is also the Webmaster of the group website : http://www-sop.inria.fr/acacia/gtpe/

8.3. European Actions

8.3.1. OntoWeb Network

The Acacia project takes part in the OntoWeb thematic network (*Ontology-based Information Exchange for Knowledge Management and Electronic Commerce*).

8.3.2. 6th PCRD

The Acacia project took part in three answers to the 6th PCRD call:

- the network of excellence *Knowledge Web*, that was accepted,
- the network of excellence *Knowledge Angels* that reached the audition phase and was then on the waiting list.
- the integrated network e-WOK (Energy, Web, Ontologies, Knowledge), that reached the second phase of the joint call IST-NMP.

8.4. Bilateral Actions

We collaborate with University of Chili on the ECOAGENT project aiming at a multiagent system for representation of the Chilean economy, with a funding of Conicyt-INRIA in 2003. On March 2003, we welcomed two Chilean researchers (Neantro Saavedra Rivano (University of Tsukuba, Japan & University of Chili) and Jorge Rivera University of Chili) and on August 2003, Olivier Corby and Rose Dieng-Kuntz visited the University of Chili.

8.5. Visit of Foreign Researchers

Neantro Saavedra Rivano (Université de Tsukuba, Japan & Universidad de Chile, Chili) and Jorge Rivera (Universidad de Chile, Chili) visited the Acacia team on March 2003.

9. Dissemination

9.1. Animation of the Scientific Community

9.1.1. Programme committees

Olivier Corby was member of the following programme committees:

- *14èmes Journées Francophones d'Ingénierie des Connaissances (IC'2003)*, Laval, July 1st-3rd, 2003.

- *KCAP'2003 Workshop on Knowledge Markup and Semantic Annotation*, Sanibel, Florida, October 26 th, 2003 http://km.aifb.uni-karlsruhe.de/ws/semannot2003/.
- *KCAP'2003 Workshop on Knowledge Management and the Semantic Web*, Sanibel, Florida, October 25th, 2003, http://www-sop.inria.fr/acacia/WORKSHOPS/KCAP2003-KMSW/.
- *14th International Conference on Knowledge Engineering and Management (EKAW'2004)*, UK, October 5th - 8th, 2004.

Rose Dieng-Kuntz was chair of the conference IC'2003 *14èmes Journées Francophones d'Ingénierie des Connaissances*, Laval, July 1st - 3rd, 2003 [16] http://www.afia.polytechnique.fr/plateforme-2003/Conferences/Appel-IC.html.

She was also member of the following programme committees:

- *Journées nationales EGC'2003 - Extraction et Gestion de Connaissances*, Lyon, January 22nd - 24th, 2003 http://www.univ-lyon3.fr/EGC2003/.
- *Journée "Déficients visuels et NTIC : présent et avenir" (DEVINT)*, June 5th, 2003, ESSI,Sophia Antipolis, http://www.essi.fr/WAI.
- *ICAIL'2003 Workshop on Legal Ontologies and Web based Legal Information Management*, in conjunction with Ninth International Conference on Artificial Intelligence and Law (ICAIL'2003), June 28th, 2003 Edinburgh, Scotland, UK .
- *Learning Software Organisations (LSO'2003)*, Luzern, Switzerland, April 2nd-4th, 2003 http://wm2003.aifb.uni-karlsruhe.de/workshop/w02/
- *First international Workshop SW-WL'03 Semantic Web for Web-based Learning, Implications in the area of educational information systems (SW-WL'03)*, http://www.sw-wl03.bessag.net, in conjunction with the CAISE'03 conference,Klagenfurt/Velden, Austria, June 16th, 2003.
- *ICEC'2003 Workshop on Semantic Web Services for Enterprise Application Integration and E-Commerce (SWSEE03)*, Pittsburgh, PA, September 30th, 2003 http://www.icec03.org/ws2.htm, in conjunction with th Fifth International Conference on Electronic Commerce (ICEC'2003).
- *7th International Workshop on Cooperative Information Agents - Intelligent Agents for the Internet and Web - (CIA'2003)*, August 27th - 29th, 2003, Helsinki, Finland http://www.dfki.de/~klusch/cia2003.html.
- *Second International Conference on Knowledge Capture (KCAP'2003)*, Sanibel, Florida, October 23rd - 26th, 2003, http://sern.ucalgary.ca/ksi/K-CAP/K-CAP2003/.
- *14ème Congrès Francophone de Reconnaissance des Formes et artificial intelligence (RFIA'2004)*, Toulouse, January 28th - 30th, 2004 http://www.laas.fr/rfia2004/.
- *The 2004 Pacific Rom Knowledge Acquisition Workshop (PKAW'2004)*, Australia, 9th - 13th August 2004.
- *First IFIP Conference on Artificial Intelligence Applications and Innovtions (AIAI'2004)*, in conjunction with IFIP World Computer Congress, Toulouse, France, August, 22-27, 2004.
- *14th International Conference on Knowledge Engineering and Management (EKAW'2004)*, UK, October 5th - 8th, 2004. She also takes part in the steering committee of the conference.

Alain Giboin was member of the following programme committees:

- *DEVINT, Journée "Déficients visuels et NTIC : présent et avenir"*, June 5, 2003, ESSI,Sophia Antipolis.

- *CONTEXT'2003, the Fourth International and Interdisciplinary Conference on Modeling and Using Context*, June 23-25, 2003, Stanford, California, USA: http://www.context.umcs.maine.edu/CONTEXT-03/
- *ÉPIQUE'2003, Deuxièmes journées d'étude en Psychologie ergonomique*, 2-3 October 2003, Boulogne-Billancourt, France: http://www-sop.inria.fr/acacia/gtpe/epique-2003/
- *CITÉ'2003, Deuxième Conférence Coopération, Innovation, Technologie*, 3-4 December 2003, Troyes, France: http://tech-cico.utt.fr/cite2003/

In 2004, Alain Giboin will be co-chair (with Anne-Marie Pinna, I3S) of the Premières Journées Francophones: Mobilité et Ubiquité 2004, 1-3 June 2004, Sophia Antipolis, France: http://www.essi.fr/UbiMob

9.1.2. Journals

Rose Dieng-Kuntz is or was:

- member of the editorial board of the journal *ETAI (Electronic Transactions on Artificial Intelligence)* on the topics *Semantic Web*.
- reviewer for the journal *IEEE Transactions on Data Engineering and Knowledge Engineering,*
- *member of the review board of a special issue of the journal Document électronique.*.

Alain Giboin was:

- reviewer for the journals: Le Travail Humain, Psychologie Française, Document
- member of the review board of a special issue of the journal Document électronique. Numérique.

9.2. Organization of conferences and courses

- The Acacia team organized the e-WOK workshop for preparation of the e-WOK integrated project proposal, on July 9th - 11th, 2003.
- The Acacia team organized the first WebLearn workshop in INRIA Sophia Antipolis on September 18th - 19th, 2003 and presented two talks in this framework:
  - Olivier Corby: *Le Moteur de Recherche Sémantique Corese* (talk and demonstration),
  - Rose Dieng: *Adaptation des travaux d'Acacia pour le E-Learning*.
- Rose Dieng-Kuntz was:
  - Co-chair of the *IJCAI'2003 Workshop on Knowledge Management and Organizational Memories* [18] http://www.inria.fr/acacia/WORKSHOPS/IJCAI2003-OM/call.html, Acapulco, August 11th, 2003.
  - Co-chair with Fabien Gandon of the *KCAP'2003 Workshop on Knowledge Management and the Semantic Web* [17], Sanibel, Florida, October 25th, 2003. http://www.inria.fr/acacia/WORKSHOPS/KCAP2003-KMSW/call.html.
  - Co-organizer of the *KCAP'2003 Workshop on Knowledge Markup and Semantic Annotation*, Sanibel, Florida, October 26th, 2003 http://km.aifb.uni-karlsruhe.de/ws/semannot2003/.
  - Co-organizer of the *AAAI Spring Symposium on Agent-Mediated Knowledge Management (AMKM'2003)*, March 24th - 26th, 2003, Stanford University, [19] http://www.dfki.uni-kl.de/~elst/AMKM/.
- In 2004, Rose Dieng-Kuntz will be Conference Chair and Alain Giboin Workshop Chair of COOP'2004, the Sixth International Conference on the Design of Cooperative Systems, May 11th - 14th, 2004, presqu'île de Giens, France: http://tech-web-n2.utt.fr/coop/

9.3. Others

9.3.1. Scientific Councils

Rose Dieng-Kuntz is member of:

- Scientific Council of the Laboratoire Perception, Systèmes, Information of the university of Rouen and of INSA-Rouen,
- Specialist Commission CS27 of UNSA.
- Specialist Commission CS27 of the Montpellier-II university,
- the CNRS prospective reflection group on *Information, communication and Knowledge*. She especially worked on the prospective on Knowledge Acquisition and Collective Memories.

9.3.2. Collective tasks

- Olivier Corby is member of:
  - CUMI (Commission of Users of Informatics)
  - CPA (commission for selection of engineers)
  - CDL (commission for software development).

  at INRIA UR Sophia Antipolis.
- Rose Dieng-Kuntz is:
  - member of the board of the Project Committee,
  - member of the Centre Committee,
  - chair of the Colors Commission.

  at INRIA UR Sophia Antipolis.
- Alain Giboin is member of the working group "Messagerie électronique" (Electronic mail) of the UR INRIA Sophia.
- Rose Dieng-Kuntz was co-ordinator of the prospective document on *Semantic Web and Web Services* at INRIA UR Sophia Antipolis and of the INRIA inter-UR prospective document on *Semantic Web*.
- Olivier Corby, Rose Dieng-Kuntz and Fabien Gandon were technical experts for evaluating the RNTL call in February 2003.
- Olivier Corby made an expertise for Ministery of Research for eligibility of a company for research tax lowering, in November 2003.
- Rose Dieng-Kuntz was expert evaluator for the European Commission for the 6th PCRD (on the topics *"Semantic-based Knowledge Systems"*) in 2003.

9.3.3. Visits

The ACACIA project welcomed:

- Alain Boucher (Institut de la Francophonie pour l'Informatique, Hanoé, Vietnam),
- Philippe Ameline (Nautilus),
- Xavier Herreros (Schneider Electric),
- Fadel Niang (École Supérieure Polytechnique du Sénégal),
- Neantro Saavedra Rivano (Université de Tsukuba, Japon & Universidad de Chile, Chili), and Jorge Rivera (Universidad de Chile, Chili),
- Philippe Sébire (LORIA) for the Syntax project.

9.4. Teaching

9.4.1. University

- The Acacia project is a welcoming team of the “École doctorale STIC of the Nice - Sophia Antipolis University (UNSA)”.
- The members of the project gave the following courses:
  - UNSA, Département d’Informatique: Thanh-Le Bach gave a practical course: "UEF 1 Informatique et programmation" (18 hours TP)
  - Olivier Corby gave the following courses:
    * ESSI: Course on XML 2 hours and 7 hours TP
    * ENTPE: Course on Knowledge engineering and XML: 12 hours
    * UTT Troyes: Course on RDF and Corese semantic search engine: 2 hours
    * ISIM Montpellier: Course on Ontologies and semantic web: 4 hours
  - ENTPE, Lyon : Rose Dieng-Kuntz is the main professor of a 30h module on artificial intelligence where Rose Dieng-Kuntz (12h on *Knowledge Acquisition and Management* and on *Multiagent Systems*), Olivier Corby (12h on *Knowledge Representation and Reasoning* and on *XML and Semantic Web*) and Bertrand Neveu, Coprin project gave courses.
  - ISIM, Montpellier: Rose Dieng-Kuntz gave 6h of courses on *Knowledge Acquisition and Knowledge Engineering* and on *Knowledge Capitalization*.
  - Institut National des Télécommunications (INT): Rose Dieng-Kuntz gave a course on *Methods and Tools for Knowledge Capitalization* (1 hour). This course will be published as a chapter of a book [42].
  - Alain Giboin gave the following courses:
    * ESSI 3rd year, Module « Interfaces graphiques homme-machine » (GUI), Université de Nice Sophia Antipolis: contribution to the organization of the module, lectures, participation to tutorials, and assessment of students’ GUI projects (21 h).
    * DESS « Ergonomie des Nouvelles Technologies de l’Information et de la Communication (ErgoNTIC) », Université de Nice Sophia Antipolis : lectures (12 h), tutoring and training supervision.
    * Coordination between the ESSI GUI Module and the DESS ErgoNTIC. This coordination aims at making work together software engineers and ergonomists as early as the learning phase, and to allow software engineering and ergonomics teachers to set up joint actions promoting cooperation between software engineers and ergonomists.
  - ESSI: Khaled Khelif gave Practical courses on XML (8 hours in February 2003) and on Java Programming at ESSI (since September 2003, 4 hours per week)

9.4.2. Theses

- Defended Theses:

  i. Carolina Medina-Ramírez : **"Contribution to semantic information retrieval: knowledge capitalization in a memory of gene interactions"**, *"Contribution à la recherche d'informations sémantiques: Capitalisation de connaissances dans une mémoire d'interactions géniques"*, Université de Nice-Sophia Antipolis, September 30, 2003.
  KeyWords: Semantic information retrieval, Conceptual Graphs, genic interactions, semantic annotations, ontology, RDF(S), XML, XSLT, documentary memories and virtual documents generation.
  Abstract
  The Semantic Web is an extension of the current web in which information is given well-defined meaning, in order to be accessible and comprehensible not only by humans but also by computers thus enabling cooperation between computers and people. This approach relies on ontologies (information exchange and search), semantic annotations (document content representation) and formal knowledge representation languages (for representing these ontologies and annotations). The ongoing works in this direction have produced several methods, knowledge representation formalisms, and tools to annotate and manipulate in a semantic manner Web resources. Nevertheless, the huge amount of formalisms proposed shows not only the increasing interest of such approach but also the problems faced when sharing annotations and ontologies. We argue that translation methods seem necessary to share and re-use knowledge using languages with different expressivity levels. In addition, among the heterogeneous resources belonging for example to a scientific community or an enterprise, documents (in electronic or paper supports) constitute a significant source of knowledge to be represented, handled, queried and diffused. The thesis offers both a translation process from languages using differents semantic levels and an environment for managing, capitalizing and distributing knowledge into an information retrieval framework.

- Current theses :

  i. Laurent Alamarguy: *Ontologies and Semantic Relations Acquisition from Biomedical Corpora*, université de Nice - Sophia Antipolis.
  ii. Thanh-Le Bach: *Construction of a Multi-Viewpoints Semantic Web*, Ecole Nationale Supérieure des Mines de Paris.
  iii. Tuan-Dung Cao: *Software Agents for the Web Mining, Application to Technological and Scientific Watch*, Université de Nice - Sophia Antipolis.
  iv. Khaled Khelif : *Semantic Web and Experiment Memory for the Transcriptome Analysis*, université de Nice - Sophia Antipolis (in collaboration with IPMC and Bayer Crop Science).

- Thesis jurys: Rose Dieng-Kuntz was member of the following thesis jurys:

  – chair for Maria Nava (University of Paris 4 - Sorbonne),
  – chair for Christian Frank at INPG (Institut National Polytechnique de Grenoble),
  – member for Rim Ehelou (university Henri Poincaré Nancy 1),
  – supervisor for Carolina Medina-Ramirez (UNSA).

9.4.3. Training

We welcomed the following trainees:

- Jean-Baptiste Ciccolella, UNSA: *« Base de données pour moteur de recherche sémantique »*
- Frédéric Corby, IUT Montpellier: *« Traduction d'une base de données médicales en RDF »*,
- Karine Delêtre, UNSA, DESS Ergonomie des Nouvelles technologies de l'information et de la communication: *« Étude ergonomique des fonctionnalités de collecticiels au sein du projet KMP »*
- Phuc-Hiep Luong, IFI (Institut de la francophonie pour l'informatique du Vietnam): *« Études sur les Graphes Conceptuels Flous et RDF(S) Flou : implémentations dans un Staff Virtuel dans le cadre d'un réseau de soins »*.
- Dabid Minier, ESIEA, Laval: *« Ontologie et annotations pour un réseau de soin dans le cadre du système Ligne de Vie »*.

9.5. Participation to conferences, seminars, invitations

Members of the team took part in conferences and *workshops* (see the bibliography). In addition to these conferences,

- Laurent Alamarguy attended TIA'2003 (*5th Symposium Terminology and Artificial Intelligence*) Strasbourg, April 31st - May 1st 2003.
- Khaled Khelif attended:
  - EGC'003 (Journées francophones d'extraction et de gestion des connaissances), January 22-24th 2003 - Lyon - France,
  - WSM2003 (Journée Web Sémantique Médical) - March 17th 2003 - Rennes - France,
  - Modelware Summer School: vers la modélisation et la sémantisation de l'information - June 16-27th 2003 - Saint-Lambert-des-Bois - France
- David Minier attended the Catel Conference about Health Care Network and Patient File (Interregional Symposium of Telemedecine, 19th September 2003, http://www.telemedecine.org/).
- Olivier Savoie attended the ICAR'2003 Summer School (Quatrième Ecole d'été sur les Intergiciels et sur la Construction d'Applications Reparties) - 4th Summer School on Middleware and on Distributed Application Design , August 25-29th, 2003, organized by the INRIA Rhone-Alpes and the ObjectWeb Consortium.
- Olivier Corby gave the following talks:
  - March 13 : Presentation of W3C XML standards at Thales in an internal technical workshop, invited as technical external speaker. Audience : 70 Thales engineers.
  - August 4-7 : Visit at Santiago University in Chili, dept of economics Talk on Corese and RDF, detailed demonstration, preparation of a prototype.
  - October 14 : presentation of the work of the team on "Knowledge Management using Corporate Semantic Web" at a workshop for documentalists on the Semantic Web (communication prepared by par R. Dieng-Kuntz) ADBS, IUT Paris 5
  - November 7 : visit of TECH CICO laboratory at UTT Troyes, Team of Manuel Zacklad and Nada Matta, demonstration of the Corese engine.
- Rose Dieng-Kuntz presented the following talks:

- *« Ontologies et Gestion des Connaissances »*, Seminar Dyxit on Knowledge Management and Design, Nancy, January 23rd, 2003.
- *« Gestion des Connaissances via un Web Sémantique d'Entreprise »* during the France-Telecom - INRIA meeting, July 10th, 2003.
- *« Models, Methods and Tools for Corporate Knowledge Management »* during the Toyota - INRIA meeting, July 22nd, 2003.
- *« Gestion des Connaissances via un Web Sémantique d'Entreprise »* during the EADS - INRIA meeting, September 23rd, 2003.
- *« Méthodes et Outils pour la Mémoire d'Entreprise »* at the "Club Informatique de Provence" Seminar, October 30th, 2003.
- *« Gestion des Connaissances via un Web Sémantique d'Entreprise »* during the Schneider - INRIA meeting, November 4th, 2003.
- *« Gestion des Connaissances via un Web Sémantique d'Entreprise »* at the Ministery of Education, November 26th, 2003.
- *« Prospective sur le Web Sémantique »* during the Panel on *« Ubiquitous Computing »* for the 20th Anniversary of INRIA Sophia Antipolis, December 4th.

- Nicolas Gronnier presented the Acacia team research and the KMP project to the students of the *Master en Systèmes d'Information de l'École des Ponts et Chaussées*, on September 18th, 2003.

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