



Activity Report 2011

Project-Team EDELWEISS

Exchanges, Documents, Extraction,
Languages, Web, Ergonomics, Interactions,
Semantics, Servers

RESEARCH CENTER
Sophia Antipolis - Méditerranée

THEME
**Knowledge and Data Representation
and Management**

Table of contents

1. Members	1
2. Overall Objectives	1
2.1. Introduction	1
2.1.1. Context and Objectives	2
2.1.2. Research Topics	2
2.1.3. International and industrial relations	2
2.2. Highlights	3
3. Scientific Foundations	3
4. Application Domains	4
4.1. Introduction	4
4.2. Telecommunications	4
4.3. Health & Biology	4
4.4. Environment & Earth Sciences	4
5. Software	5
5.1. Corese	5
5.2. Semantic Web Import Plugin for Gephi visualization	5
5.3. ISICIL	5
6. New Results	8
6.1. Graph Based Knowledge Representation	8
6.1.1. Knowledge Graph Abstract Machine	8
6.1.2. Semantic Web Graph Visualization	8
6.1.3. Semantic Social Network Analysis	9
6.1.4. Index Summarizing the Content of RDF Triple Stores	9
6.1.5. Rules for the Web of Data	9
6.1.6. Collaborative Management of Interlingual Knowledge	9
6.1.7. Reuse of Data Analytics Contents and Processes	10
6.2. Interaction Design	10
6.2.1. Question Answering over Linked Data	10
6.2.2. Mobile Access to the Web of Data	11
6.2.3. Access Control for the Web of Data	11
6.2.4. ISICIL	12
6.2.5. Models and Methods for Representing and Identifying Groups of Individuals and Their Activities	12
6.2.5.1. Models and Methods for Representing and Identifying "Collective Personas"	12
6.2.5.2. Models and methods for Representing and Identifying Relationships between Individuals	12
6.2.6. Comparing and Bridging Models of Shared Representations and Representation Sharing Processes	17
6.2.7. Frameworks for taking pragmatic dimensions of ontologies into account	17
6.2.8. Explanation of Semantic Web Query Results	17
6.2.9. Pervasive Sociality through Social Objects	18
7. Contracts and Grants with Industry	18
7.1. Alcatel Lucent Bell	18
7.2. SAP	18
8. Partnerships and Cooperations	19
8.1. Regional Initiatives	19
8.2. National Initiatives	19
8.2.1. DBpedia.fr	19
8.2.2. Kolflow	19

8.2.3. DataLift	19
8.2.4. ISICIL	19
8.3. International Initiatives	20
9. Dissemination	20
9.1. Animation of the scientific community	20
9.2. Teaching	22
9.2.1. PhD & HdR	23
9.2.2. Jury Member	23
9.2.3. Internship	24
10. Bibliography	24

Project-Team EDELWEISS

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2. Overall Objectives

2.1. Introduction

We would like to pay a tribute to our dear friend and colleague Rose Dieng-Kuntz who was the founder and leader of the Acacia and Edelweiss teams.

2.1.1. Context and Objectives

Actors and interaction devices are becoming more and more mobile while knowledge sources, services and their networks are becoming ubiquitous. In this context we witness the emergence of communities of interest and/or practice, very light and agile structures that can be ephemeral and virtual. To assist the knowledge life-cycle of such communities we are interested in providing tools and methodologies supporting the interactions and the memories of these focused groups. Throughout its life time, a community uses, produces, exchanges, and shares resources materializing knowledge through various types of documents (that may be structured or not, textual, multimedia, etc.). A community may also rely on some services or programs available inside the community or outside. To ensure mutual understanding between community members, the exchanges inside a community rely on a common terminology and common concepts that may evolve throughout the life of the community. These exchanges can also use various media.

The context of the emergence of such virtual communities (inside organizations, across organizations or independently of any organization) is the use of the Web not only for information sharing but also for support to cooperation, the use of new interaction channels, the evolution of Web technologies (Semantic Web, social Web, Web services, mobile Web, ubiquitous Web).

Edelweiss aims at offering models, methods and techniques for supporting ergonomic, web-based knowledge management and collaboration in virtual communities interacting with information resources through the Web. We perform research on graph-based, ontology-based, web-based knowledge representation and inferences for interacting with or through information resources.

2.1.2. Research Topics

The support to virtual communities can be studied according to several viewpoints:

- The activities of the community consist of structuring, searching, retrieving, reusing, and composing the community internal or external resources / services. A support to these activities can be offered through a Semantic Web based approach, by processing annotations of such resources / services.
- Conceptual modeling of the interactions and collaboration among community members mediated by tools could enable us to propose ergonomic tools adapted to support such collaboration.
- To achieve the development of such supporting tools and methodologies, basic blocks are needed to represent knowledge and to reason and perform inferences on this representation: we choose to rely on a graph-based representation.

Therefore, we study thoroughly two complementary research directions, corresponding to these viewpoints:

1. Interaction Design of Semantic Systems: Supporting human interoperability in semantic activities through articulating functionalities and in scenario management activities, Experimental evaluation of inferences for information retrieval and other tasks, Ontology-based intelligent interfaces.
2. Graph-based Knowledge Representation of the Semantic Web Knowledge: Scaling graph representations and operations, Ontology-based model driven engineering, Inferences characteristic to graphs and distributed Web sources, semantic annotation of information resources.

2.1.3. International and industrial relations

We collaborate or collaborated with industry in the following fields: telecommunications (Orange Labs, Telecom Valley), earth sciences and environment (Ademe, BRGM, IFP), biology (IPMC, Immunosearch), semi-conductors (Philips Semi-Conductors-NXP), manufacturing (Estanda) and car industry (ItalDesign, Renault). In the past, we took part in the Integrated Project Palette, in the STREPS projects SeaLife and SevenPro and in the Knowledge Web Network of Excellence.

2.2. Highlights

- Fabien Gandon was nominated INRIA representative at W3C.

3. Scientific Foundations

3.1. Social Semantic Web

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]. 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, but sharing a common interest).

The former Acacia project approach relied on the analogy between the resources of an organizational memory and the resources of the Web. We considered that an organizational memory can be materialized in a community semantic Web [7], [60], that consists of:

- resources (i.e. documents in XML, HTML or other 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.

According to [54], Communities of Practice (CoPs) are “groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis”. CoPs can be found within businesses, across business units or across company boundaries [66], still they differ from business or functional units, from teams and networks: people belong to CoPs at the same time as they belong to other organizational structures. An effective organization comprises a constellation of interconnected CoPs, as these are privileged nodes for the exchange and interpretation of information. CoPs preserve the tacit aspects of knowledge that formal systems cannot capture. CoPs can be considered as a means by which knowledge is “owned” in practice. Indeed, such groups allow the functions of creation, accumulation and diffusion of knowledge in organizations.

The Edelweiss project-team extends this hypothesis to virtual communities and considers that a support to knowledge management and cooperative work in a community can also rely on a Community Semantic Web or a Community Memory.

Initially concerned with formal and technical aspects, the Semantic Web community recently acknowledged the necessity to take seriously into account uses and users of Semantic Web applications so that such applications can be accepted by users and their organizations. An indicator of this new concern is the emergence of scientific events such as SWUI, the International Workshop series on End-user Semantic Web Interaction (2004, 2005, 2006, 2007, 2008, 2009), and more recently VISSW, the International Workshop series on Visual Interfaces to the Social and the Semantic Web (2009, 2010), which encompasses the social and semantic approaches to the Web. The aim of these workshops is to help Semantic Web application designers bring the power of the semantic Web to end-users, applying Interaction Design and more specifically Social Interaction Design. Interaction Design is the discipline of defining and creating the human interaction with digital, environmental or organizational systems. Interaction design defines the behaviors or interactions of an object or system over time with its users' population. Interaction designers create systems that are typically informed by research on users and their practices. Social interaction design accounts for interactions among users as well as between users and their devices. Social interaction design is practice-oriented. It is concerned with sign and symbolic value, social behaviors, etiquette and norms, groups and communities, structured interactions, and routines, sequencing, and temporal organization.

Interaction design is critical to a number of applications: an application may use state-of-the-art algorithms; if it does not provide a usable interface, it will not be effective. For interactions to be supported efficiently in a community, supporting tools have to be designed taking into account the nature, the rules, the protocols, the context, etc. of these interactions. In particular, community-supporting tools must:

- help users to articulate their activities and the representations they handle during these activities;
- be able to assist or reproduce some of the inferences involved in the interactions and for instance involved in switching representations from some member to another;
- reduce the heterogeneity of information sources and interfaces and ease the integration of the multiple interaction channels used by community for its interactions. Assisting the cooperation within a community will raise issues of personalization, interface ergonomics, context-awareness and transversally; it will also raise the issue of the links between semantics (as in knowledge representation formalisms) and semiotics (as in representations for user interfaces).

4. Application Domains

4.1. Introduction

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. Edelweiss work on virtual communities has potential applications in medical field, in pharmacological field, in engineering, in earth sciences and in telecommunications.

4.2. Telecommunications

Our work on community memory, in particular the use of intelligent agents, ontologies and XML technology, is of particular interest for telecom companies. A collaboration with Orange Labs took place with a PhD Thesis and continues through an ANR project. We also collaborated with Telecom Valley and the GET (ENST and ENST-Bretagne) for our work on skills management in the RNRT KmP project. We collaborated with Philips Semi-Conductors - NXP, for an intra-firm skills management application. We finally collaborated with ENST-Bretagne for the CNRS Specific Action on "Semantic Web and E-learning".

4.3. Health & Biology

Our work on community memory, in particular our Semantic Web approach has been applied to several biomedical applications: experiment memory for transcriptome analysis (in the framework of the BioMarker project in collaboration with IPMC and ImmunoSearch). In the framework of SeaLife IST project, we worked on a semantic browser for Life Sciences, with scenarios such as evidence-based medicine, or literature and patent mining. In ImmunoSearch project, our work on literature mining was useful for supporting experiments aimed at studying harmlessness of the molecules used in perfumes, aromatics and cosmetics.

4.4. Environment & Earth Sciences

We collaborated with IFP (Institut Français du Pétrole) and BRGM (Bureau de Recherches Géologiques et Minières) on semantic portals enabling access to resources and services in Earth Sciences domain. Semantic portals assist geologists in discovering geological sites where storing carbon dioxide (CO_2) produced by power stations, so contributing to reductions in global Greenhouse Gas emissions. We also collaborate with Ademe (Agence de l'Environnement et de la Maîtrise de l'Énergie) on technological and scientific monitoring as well as corporate intelligence within the ISICIL ANR project.

5. Software

5.1. Corese

Participants: Olivier Corby [correspondant], Fabien Gandon.

Corese¹ (COnceptual REsource Search Engine) is a Semantic Web Factory. It enables users to load and process RDFS schemas, RDF metadata and to query the base of annotations thus created, by using the SPARQL Query Language.

Corese implements RDF, RDFS and SPARQL 1.1 Query Language & Update. Furthermore, Corese query language integrates original features such as approximate search, SQL or XPath. Approximate search consists of searching the best approximate answers to a query according to the ontology types. Corese also integrates a SPARQL-based Rule Language for RDF.

Corese is a Semantic Web Factory that enables us to design and develop Semantic Web applications; it is available for download. In the past, Corese benefited from an INRIA software development support (ADT) with two software engineers. Corese is registered at the APP and in 2007 we decided to distribute it as open source software under license CeCILL-C.

Corese is used and has been used in more than 45 applications, 21 PhD Thesis and is used for education by 8 institutions. It is used as a Semantic Factory in such projects as Ontorule, Palette, SevenPro and SeaLife european projects, in e-WOK Hub, Neurolog, ISICIL and Kolflow ANR projects, BioMarker and KmP projects, Semantic Web Import Plugin for Gephi visualization and ECCO ontology editor. The work on Corese was published in [57], [58], [59], [56], [1], [5], [3], [2], [4].

This year we released a major new version 3.0 based on the KGRAM SPARQL 1.1 interpreter. KGRAM (see 6.1.1) is a generic SPARQL interpreter that can query not only RDF but also labeled graphs.

Web page: <http://www.inria.fr/sophia/edelweiss/software/corese>

5.2. Semantic Web Import Plugin for Gephi visualization

Participants: Erwan Demairy [correspondant], Fabien Gandon, Olivier Corby.

The SemanticWebImport² plugin is intended to allow the import of semantic data into Gephi open graph visualization platform. Gephi is an interactive visualization and exploration platform for all kinds of networks and complex systems, dynamic and hierarchical graphs. The imported data are obtained by processing a SPARQL request on the semantic data. The data can be accessed following three manners:

1. by accessing local RDF & RDFS files and using the embedded Corese engine to apply the SPARQL request;
2. by accessing a remote REST SPARQL endpoint. In that case, the SPARQL request is applied remotely and the graph is built locally by analyzing the result sent by the endpoint;
3. by accessing a remote SOAP SPARQL endpoint. As for the REST endpoint, the resulting graph is built from the result returned by the endpoint.

The software is released under version 1.0.

Web page: <http://wiki.gephi.org/index.php/SemanticWebImport>

5.3. ISICIL

Participants: Sébastien Comos, Nicolas Delaforge, Fabien Gandon [resp.].

¹<http://www.inria.fr/sophia/edelweiss/software/corese>

²<http://wiki.gephi.org/index.php/SemanticWebImport>

The ISICIL software platform is made of several software components:

- XUL (XML-based User interface Language) extensions for the Firefox browser to assist the technology watch and business intelligence tasks by collecting relevant metadata according to the navigation context of the user.
- An application server based on Tomcat publishes services using the REST protocol to process requests of the users' applications and in particular the navigation extensions.

This architecture is summarized in Figure 1. Its major interest lies in the flexibility introduced by the loose coupling between REST services and navigators extensions or other applications.

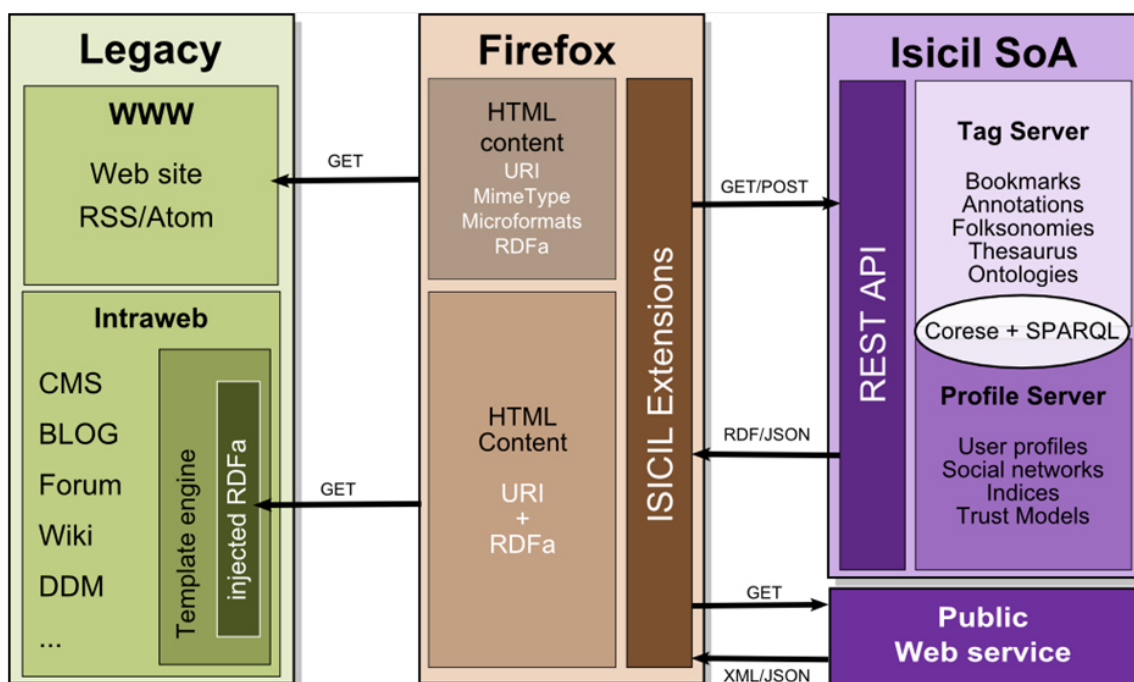


Figure 1. ISICIL Platform Architecture

In the context of the ISICIL ANR project, we have developed a Semantic Web server which provides core services to manage simple tagging of resources (internal or from the Web) and to assist the semantic enrichment of the folksonomy of our communities of users. This server's implementation is based on the ISICIL main framework. The tagging model combines already existing ontologies such as SIOC³, SCOT, and Newman's Tag Ontology⁴ as shown in Figure 2. SRTag, the model of folksonomy enrichment, is based on a named graph mechanism in order to maintain diverging statements made between tags using SKOS (for thesaurus like relation between tags) or SCOT (for spelling variant relations), and is shown in Figure 3.

The functionalities of this server can be divided into three categories:

1. Tagging : creating a tag; get tag suggestions based on the input characters; create a tagging, i.e. a link between a resource, a user, and a tag.

³<http://sioc-project.org>

⁴<http://www.holygoat.co.uk/owl/redwood/0.1/tags>

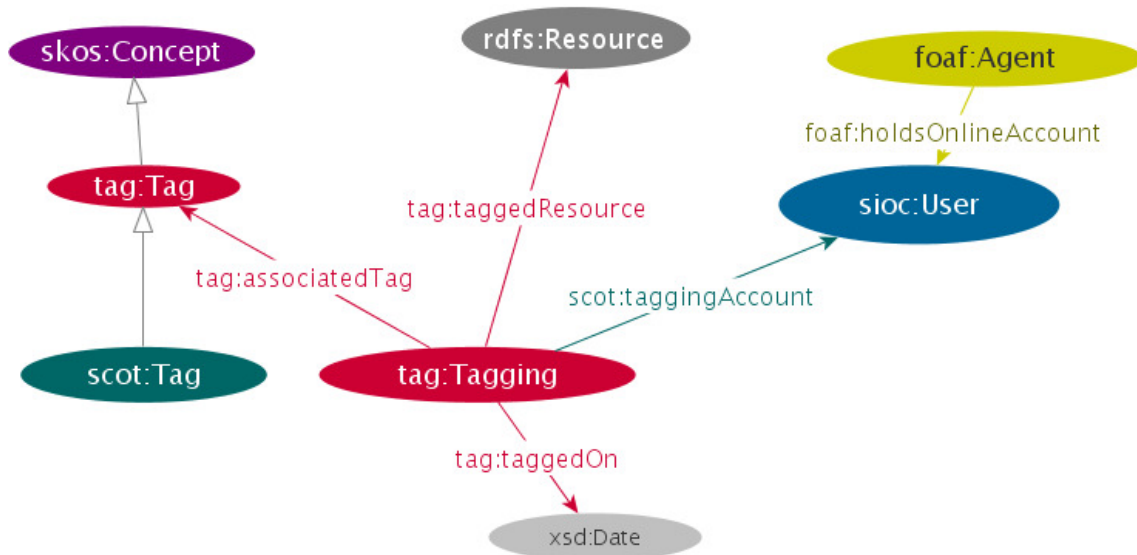


Figure 2. Model of tagging used in the Semantic Tag Server

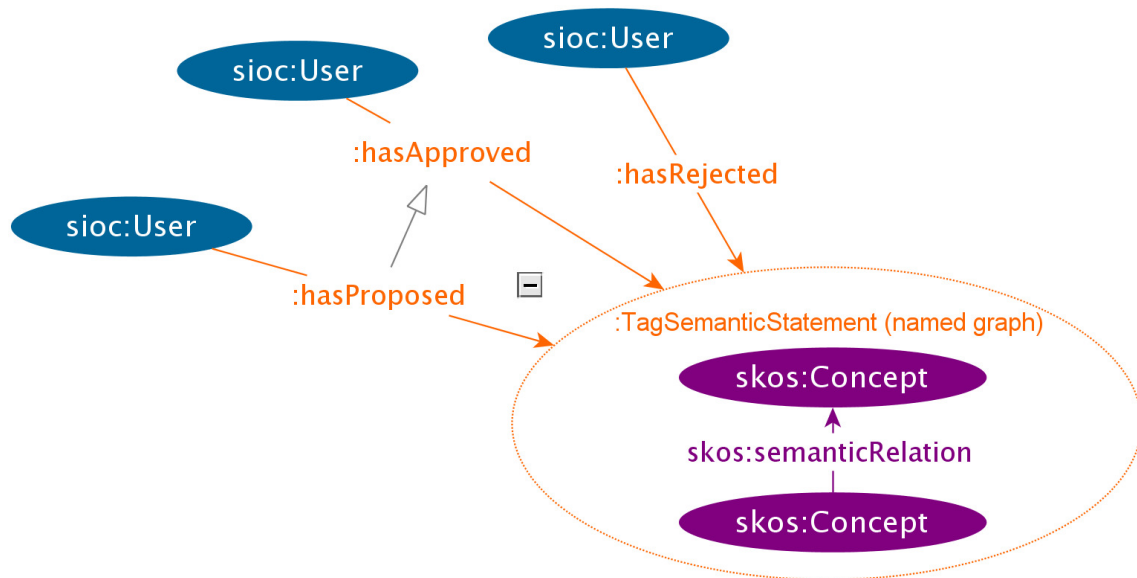


Figure 3. Folksonomy enrichment model

2. Computing: an external library (exported as a java jar file) has been developed to perform computations on the tagging data. Two types of computations have been implemented:
 1. Spelling Variant detection.
 2. Related tag detection based on the computation of the similarity between tags [63].
3. Managing Semantic relations between tags: get semantically related tags, reject or propose new semantic relations.

We developed a Firefox extension to help users navigate within a folksonomy and organize semantically the tags. The main idea behind this tool is to combine organization tasks with everyday tasks in the least intrusive way, that is to say, without forcing the user in any way, and by providing a user friendly graphical interface. This tool, developed using the XUL framework⁵, is supported by the SRTag model and the Semantic Tag Server. Users are provided with search bar for navigating the folksonomy. When available, other tags are suggested and ordered according to their semantic relation with the searched tag (broader, narrower, related, spelling variant). Each suggestion can be either :

- clicked to search content tagged with this tag;
- rejected by clicking a checkbox;
- modified thanks to a drag-and-drop mechanism where a tag can be dropped in another category of semantic relation.

Web page: <https://gforge.inria.fr/projects/isicil/>

6. New Results

6.1. Graph Based Knowledge Representation

6.1.1. Knowledge Graph Abstract Machine

Participants: Olivier Corby, Catherine Faron-Zucker, Fabien Gandon.

KGRAM (Knowledge Graph Abstract Machine) is a generic interpreter for W3C SPARQL Query Language that operates not only on RDF graphs but on labelled graphs. The interpreter interacts with the target graph through proxies that implement an interface: *Producer* enumerates edges from the target graph, *Evaluator* evaluates filters and *Matcher* takes entailments into account.

This year, work have been done to leverage KGRAM up to SPARQL 1.1 Query Language & Update. It implements most of current version of the recommendation, except the *service* statement. It passes almost all W3C SPARQL 1.1 test cases.

In addition, the Corese Semantic Web Factory has been redesigned and modularized into release 3.0 entirely based on KGRAM interfaces and proxies. Corese 3.0 is a new lightweight RDF/S implementation with SPARQL 1.1. We ported the former Inference Rule engines (forward and backward engines) onto Corese 3.0. We also ported former SPARQL extensions: approximate search based on ontological distance, SQL and XPath in SPARQL 1.1, edge enumeration and length of Property Path, pragmas.

This new version is already used in several applications among which: cartography at IGN [28], design constraint modeling at CSTB [35], technological watch in ISICIL ANR project. It is also used in several PhD Theses in the team. A list of applications can be found on Corese Web site⁶.

6.1.2. Semantic Web Graph Visualization

Participants: Olivier Corby, Nicolas Delaforge, Erwan Demairy, Fabien Gandon [contact].

Thanks to an INRIA grant (ADT), we design and develop a Semantic Web Gephi Plugin. This plugin is coupling Corese and the Gephi Open Graph Visualization Platform to provide a framework to query and visualize RDF data taking into account their schemas. See the web pages^{7 8}.

⁵<http://developer.mozilla.org/en/XUL>

⁶<http://www-sop.inria.fr/teams/edelweiss/software/corese/>

⁷<http://wiki.gephi.org/index.php/SemanticWebImport>

6.1.3. *Semantic Social Network Analysis*

Participants: Guillaume Erétéo, Fabien Gandon.

The PhD thesis of Guillaume Erétéo [14] in the context of the ANR project ISICIL allowed us to analyze the characteristics of the heterogeneous social networks that emerge from the use of web-based social applications, with an original contribution that leverages Social Network Analysis with Semantic Web frameworks. Social Network Analysis (SNA) proposes graph algorithms to characterize the structure of a social network and its strategic positions.

Semantic Web frameworks allow representing and exchanging knowledge across web applications with a rich typed graph model (RDF), a query language (SPARQL) and schema definition frameworks (RDFS and OWL). In this thesis, we merged both models in order to go beyond the mining of the link structure of social graphs by integrating two approaches: (1) semantic processing of the network typing and (2) emerging knowledge of online activities.

In particular we investigated how (1) to bring online social data to ontology-based representations, (2) to conduct a social network analysis that takes advantage of the rich semantics of such representations, and (3) to semantically detect and label communities of online social networks and social tagging activities.

This work was published at [15], [14].

6.1.4. *Index Summarizing the Content of RDF Triple Stores*

Participants: Adrien Basse, Fabien Gandon, Isabelle Mirbel.

We are interested in designing an architecture to support the distribution of a SPARQL query on a small and fixed number of RDF repositories. To do so, the key stage is to characterize the content of the base of each server in order to be able to predict if a server could contribute or not to the answer of a query. In the context of the PhD Thesis of Adrien Basse we propose an algorithm to extract a compact representation of the content of an RDF store. We improved the canonical representation of RDF graphs based on DFS code proposed in the literature by providing a join operator to reduce the number of generated redundant patterns.

6.1.5. *Rules for the Web of Data*

Participants: Oumy Seye, Olivier Corby.

In the context of this PhD thesis, the focus is on Rules for the Web of data. We are interested in integrating Rule Interchange Format (RIF) - W3C recommendation for exchanging rules on Web - to others W3C technologies. The aim of this year is to study the integration possibilities of RIF-BLD into semantic Web technologies. RIF-BLD is the dialect of RIF for logic-based systems. Firstly, we have studied the state of the art. Secondly we improved the RIF-BLD parser for presentation syntax and XML syntax. As RIF-BLD can be used with RDF data and OWL ontologies, it is interesting to consider RIF inferences in queries on RDF graph structure. That is why we finally study the integration of RIF-BLD into the Corese Semantic Web engine. In this last step, we have implemented the mapping of abstract syntax tree of RIF-BLD to abstract syntax tree of SPARQL. Thus, we can now execute logic inferences of RIF-BLD in the backward engine of Corese.

We have a paper accepted at EGC 2012 presenting RIF2SPARQL [44], a translation of RIF-BLD statements in SPARQL to perform the logical inferences of RIF-BLD on the Corese Semantic Web Factory. These inferences are implemented in backward chaining approach. We have designed and implemented the mapping of RIF-BLD to SPARQL.

6.1.6. *Collaborative Management of Interlingual Knowledge*

Participants: Maxime Lefrançois, Fabien Gandon.

⁸<https://gforge.inria.fr/projects/segviz-public/>

We are interested in bridging the gap between the world of natural language and the world of the Semantic Web, in particular to support multilingual access to the Web of Data and management of interlingual knowledge bases. We introduce the ULiS approach, that aims at designing a pivot-based NLP technique called Universal Linguistic System, using Semantic Web formalisms, and being compliant with the Meaning-Text theory. Through ULiS, a user could interact with an Interlingual Knowledge base (IKB) in controlled natural language. Linguistic resources themselves (e.g. dictionary, grammar) are part of a specific IKB, thus, actors may enhance them (i.e. the model of the controlled natural language), through requests in controlled natural language (e.g., add a new lexical units, add grammar rules).

In [30] we proposed a novel approach to define Interlingual Lexical Units classes in the Interlingual Lexical Ontology so that they support the projection of their lexicographic definition on themselves using the OWL formalism. This approach is compliant with the Meaning-Text Theory.

In [31], [40] we introduced three basic interaction scenario for ULiS and we proposed and overviewed the layered architecture of ULiS: meta-ontology, ontology, facts; and ontology, interlingual knowledge, situational knowledge.

We have started a collaboration with the RELIEF project that deals with the construction of a French Lexical Network (Alain Polguère, CNRS-ATILF).

6.1.7. Reuse of Data Analytics Contents and Processes

Participants: Corentin Follenfant, Fabien Gandon, Olivier Corby.

Industrial Business Intelligence (BI) proposes tools and methods to perform data analysis over heterogeneous enterprise sources. They allow one to harvest, federate, cleanse, annotate, query, organize and visualize data in order to support decision making with human-readable documents such as reports, dashboards, mobile visualizations. Such processes currently require expertise in technical domains like relational modeling in order to produce relevant content.

Users willing to do so without following the learning curve have to reuse existing content to create new one, and need to be guided throughout the workflow. Recommender systems can contribute to easing their progression, but most of them will operate inside walled garden for specific tasks instead of assisting the user throughout his workflow.

Semantic Web tools allow us to provide a common ground for modeling the different operations that compose BI workflows with RDFS vocabularies, capturing usage of the underlying transformations operators within document repositories with RDF graphs, and enabling further composition and reuse of BI operations to achieve new analysis. We introduced with [38] an extension of the RDF Data Cube vocabulary⁹ to describe these operations as flexible services that are composed by matching multidimensional data structures interfaces, and validated this model on a production repository containing 900 BI documents decomposed into 8000 documents snippets.

The underlying sequence of operations specific to each snippet was then extracted into a unique RDF graph. Aggregate SPARQL queries allow us to compute basic usage statistics for BI operations that can feed recommender systems such as BI workflows wizards. Besides refining the proposed model, next steps include evaluating the technical usability of SPARQL property paths patterns for data lineage and to identify frequent patterns in sequences of BI operations.

This PhD Thesis is done with a CIFRE industrial grant from SAP Research.

6.2. Interaction Design

6.2.1. Question Answering over Linked Data

Participant: Elena Cabrio.

⁹<http://publishing-statistical-data.googlecode.com/svn/trunk/specs/src/main/html/cube.html>

While an increasing amount of semantic data is being published on the Web, the crucial issue of how typical Web users can access this body of knowledge comes to light. This PostDoc project focuses on the development of methods for a flexible mapping between questions in natural language, and data objects. The main purpose is to allow an end user to submit a query to an RDF triple store in English and get results in the same language, masking the complexity of SPARQL expressions and RDFS/OWL inferences involved in the resolution, but at the same time profiting from the expressive power of these standards. In particular, we address the problem of automatic identification of the relevant relations in Question Answering (QA), to capture the context in which the requests should be interpreted, to be able to determine the constraints on the database query.

We aim at investigating the applicability of the Textual Entailment¹⁰ (TE) approach, recently proposed as a general framework for applied semantics, where linguistic objects are mapped by means of semantic inferences at a textual level [55]. According to such framework, entailment relations can be detected between an input question and a set of relational patterns that represent possible lexicalizations of the relations of interest. Such relations, collected in a pattern repository, can be associated to a SPARQL query to the database. A TE system should therefore first try to establish an entailment relation between an input question and each of the relations in the pattern repository. Then, the SPARQL queries associated to the relations for which the entailed patterns have been found are composed in a single query to the database.

Since this PostDoc research work has just started, our early efforts were directed toward the study of the state of the art on QA over Linked Data. We are currently carrying out a feasibility study on the extraction of the relational patterns from Wikipedia (as the source of free text) and the use of DBpedia¹¹ as a linked data resource. For the experimental part, we are considering *energy and environment* as the reference scenario.

6.2.2. Mobile Access to the Web of Data

Participants: Luca Costabello, Fabien Gandon.

This thesis, directed by F. Gandon and I. Herman (CWI and Semantic Web Activity Lead at W3C) deals with accessing the Web of Data from mobile environments. The first year addressed the multi-faceted relationship between ubiquitous consumption of Linked Data and mobile context. More specifically, focus has been put on RDF adaptive representation and on context-aware SPARQL endpoints access control.

When accessed from devices immersed into ubiquitous environments, RDF resources must be properly adapted to the mobile context in which the consumption is performed. A domain-independent, lightweight vocabulary for displaying Web of Data resources in mobile environments has been designed (PRISSMA, Presentation of Resources for Interoperable Semantic and Shareable Mobile Adaptability [36]). The vocabulary is the first step towards an adaptive rendering engine for RDF data coupled with a declarative framework to share and re-use presentation information for context-adaptable user interfaces for Linked Data.

Another line of research regards the role of mobile context in restricting access to the Web of Data. Ubiquitous connectivity enables new scenarios in consuming Linked Data and access control in such pervasive environments must not ignore the mobile context in which RDF consumption takes place, as uncontrolled access in given situations may be undesired by data providers. The work led to enhance the access control framework for SPARQL endpoints proposed by teammate Serena Villata (see 6.2.3) with the notion of mobile context provided by PRISSMA.

6.2.3. Access Control for the Web of Data

Participant: Serena Villata.

This research activity is mainly focussed on the field of Knowledge Representation. First, we have proposed a new access control model for the Web of Data and the Social Web. In particular, we have introduced the S4AC ontology¹² where the meaning of the access policies and their components is defined. This access control model proposes, also, a contextual evaluation of the accessors' information. This model has been applied both to the world of Linked Data and to the world of social networks. This research activity has been addressed in the context of the DataLift ANR project [21], [20].

¹⁰http://aclweb.org/aclwiki/index.php?title=Textual_Entailment_Portal

¹¹<http://dbpedia.org>

¹²<http://ns.inria.fr/s4ac/>

Second, we have continued a research activity in the area of argumentation theory. In this context, we are exploring the use of argumentation theory for modeling trust in those systems which deal with incomplete knowledge, and for providing explanations about the agents' choices [22], [19], [23], [25].

6.2.4. ISICIL

Participants: Nicolas Delaforge, Fabien Gandon.

As the leading team of the ISICIL project, we have developed many software components (client-side and server-side) to enrich the ISICIL platform. First, the whole server mechanism was redesigned, in order to improve the server performance, to strengthen and modularize the framework as well. Many semantic REST services were added (activity stream, syndication, subscription/notification, graphs and charts visualizations).

In collaboration with Erwan Demairy, in charge of the SegViz ADT, a Gephi-ISICIL connector was implemented, allowing ISICIL users to visualize the results of their SPARQL queries directly into a dynamic graph. A demo of this work was presented during the ISICIL public seminar in September. Furthermore, projects such as Datalift and ISICIL had brought out the need of an access control model for the Web of Data. For this purpose, we designed the S4AC model and ontology and we realized a prototype to evaluate it based on the ISICIL dataset Figure 4.

Since the Philoweb conference in 2010, a workshop dedicated to *philosophical engineering* was attached to the french IC conference in Chambéry. We presented there the advancement of a brand new bookmark model called *Webmarks* which semantically models the user interest on a web resource (Figure 5 & 6). A long paper on this work was accepted in the EGC 2012 conference and will be published in the RNTI journal (Hermann editions) [27].

We also collaborate with the I3S team in a task of *semantization* of a commercial wiki, called Mindtouch. This wiki is enhanced with semantic description of its content (Figure 7), its users are part of the ISICIL social network and their activities on the wiki are reported on the metadata server. This tool represents the editorial layer of the software bundle developed to improve the business intelligence tasks. This work was also accepted as a long paper in the EGC 2012 conference [26].

6.2.5. Models and Methods for Representing and Identifying Groups of Individuals and Their Activities

6.2.5.1. Models and Methods for Representing and Identifying "Collective Personas"

Participant: Alain Giboin.

Context of the work: ISICIL project.

As opposed to Individual Personas (which are user models represented as specific, realistic humans), Collective personas are models representing specific, realistic groups of people as such (e.g., teams, communities). Collective personas are aimed to design groupware more closely adapted to groups. In 2010, we updated our review of the existing methods for elaborating collective personas. This year, we published the updated review [17].

6.2.5.2. Models and methods for Representing and Identifying Relationships between Individuals

Participants: Alain Giboin, Neji Bouchiba.

Context of the work: AVISICIL project, in collaboration with researchers from the Kewi team (I3S, UNS) and from the Laboratoire de Psychologie Cognitive et Sociale (UNS) who are involved in affective computing design projects (designing systems intended to help elderly people maintain their relationships, or autistic children to build relationships with others).

The screenshot displays the 'Access Condition Set Editor' window. The title bar includes the 'ISICIL' logo and the text 'Access Condition Set Editor'. The main interface features a 'Label' field containing 'Colleagues'. Below this, the 'ACS Type' is set to 'Disjunctive (OR)'. Three access conditions are listed, each with a dropdown menu for 'Accessor', a relationship type, and a specific value. Each condition also includes a 'SPARQL Box' with a corresponding query.

Label: Colleagues

ACS Type

- Disjunctive (OR)
- Conjunctive (AND)

Accessor is Serena Villata

ASK { ?accessor a foaf:Person }
BINDINGS ?accessor { <http://ns.inria.fr/isicil/id/person/svillata> }

Accessor is member of Edelweiss Team

ASK { ?group foaf:member ?accessor }
BINDINGS ?group { <http://ns.inria.fr/isicil/id/group/edelweiss+team> }

Accessor has relationship rel:colleagueOf

ASK { ?accessor ?relationship ?provider }
BINDINGS ?relationship { <http://purl.org/vocab/relationship/colleagueOf> }

OK Annuler

Figure 4. S4AC Access Policy Editor



Figure 5. Webmark GUI

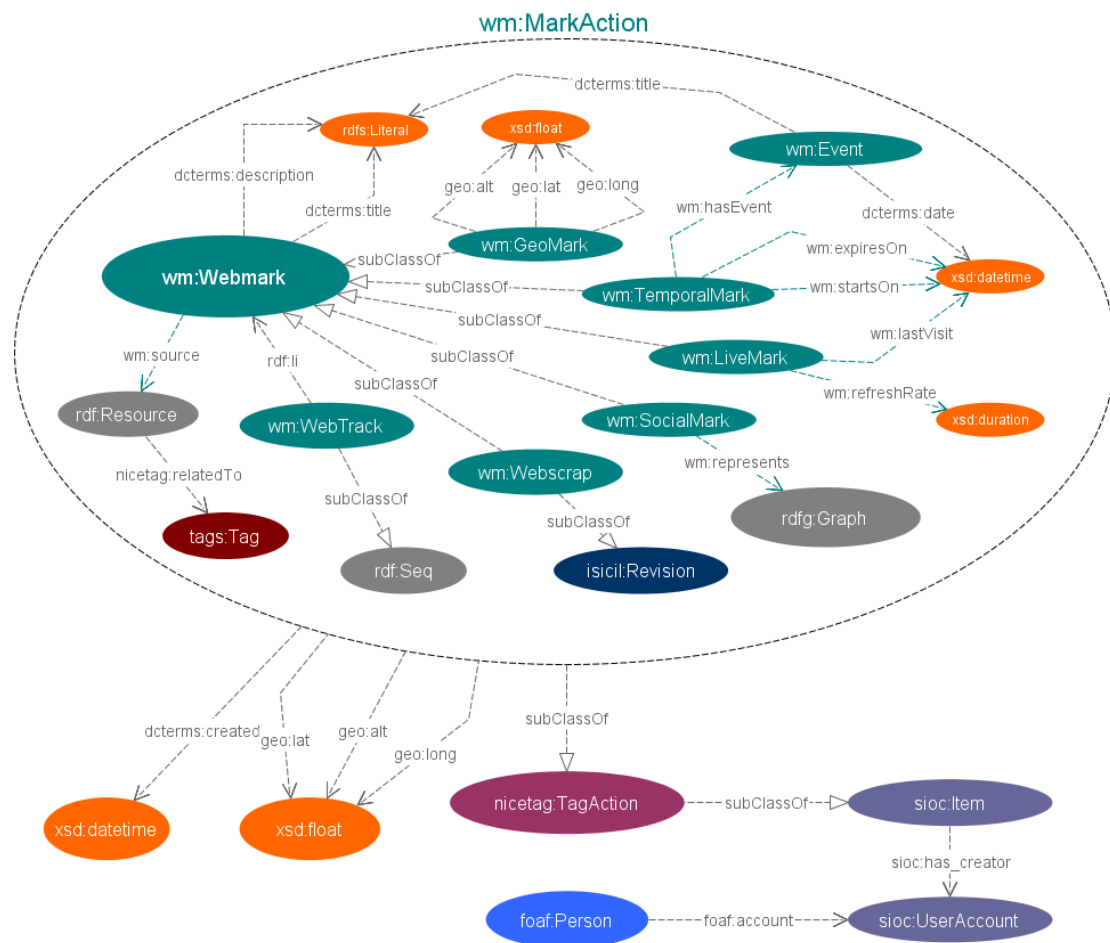


Figure 6. Webmark Model

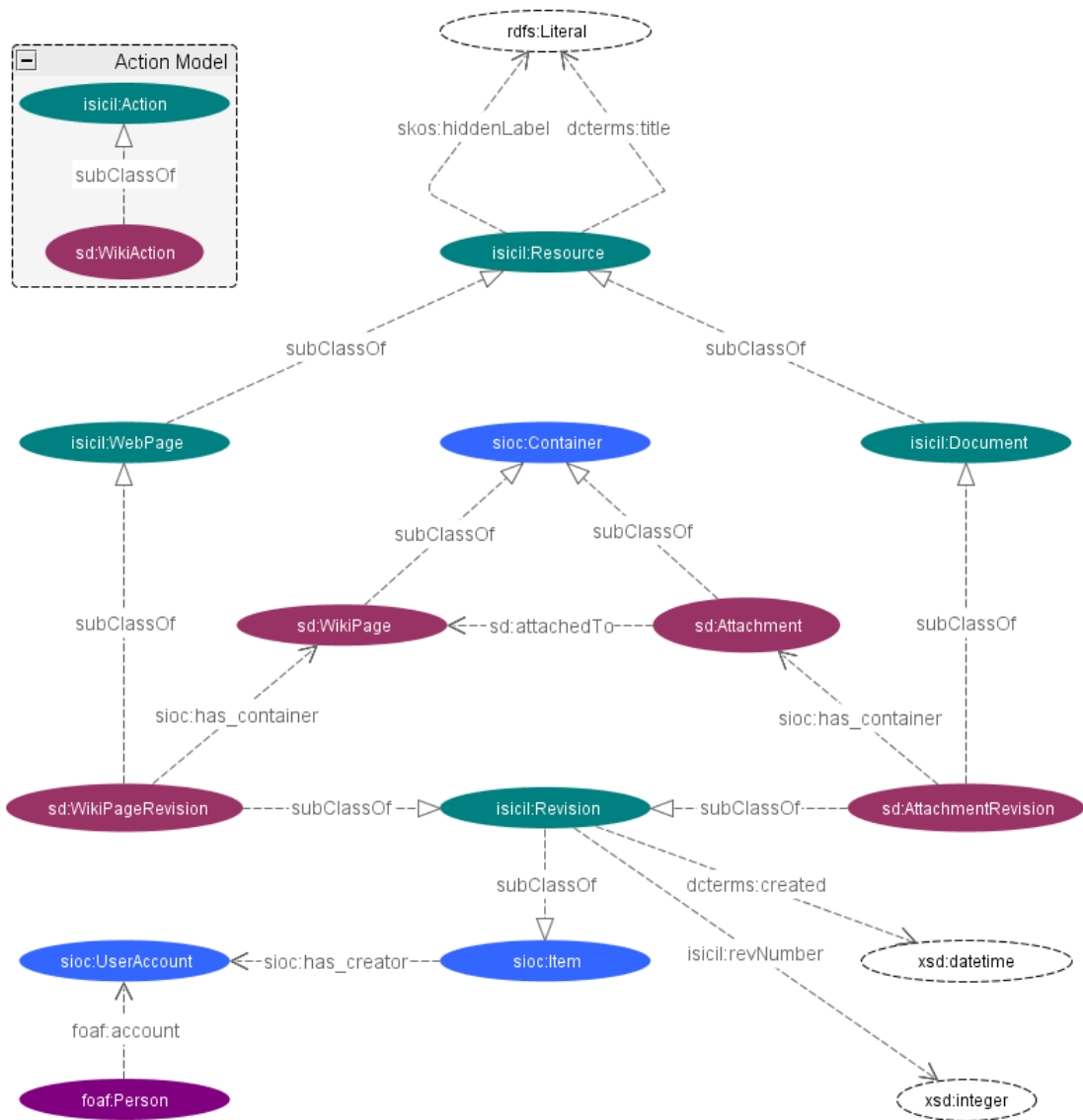


Figure 7. SweetDeki Resource Model

Digital technologies have been claimed to contribute to prevent elderly people from social isolation or loss of social ties. For example, ubiquitous computing, online social networking and affective computing have been reported to *facilitate social interaction* [64] or *to enhance social connectedness* [61] among the elderly. Participating to a project aimed to design a system for recognizing, through various sensors, the affective states (emotions) that indicate a loss or maintenance of social ties, we conducted a social ergonomic study to provide elements of design and evaluation of such a system. Noting that depressive states are among the most significant signs of an actual or potential loss of social ties (see, e.g., [65]), we focused the study in particular on: (a) the models describing the depressive states and the process of their recognition, and the links between these states and the state of social ties; (b) the sensors that can contribute to this recognition. In order to evaluate our solution (so-called GeREmo) with the elderly, we also identified, from an analysis of existing studies on the acceptability of digital technologies, criteria for assessing the acceptability of the GeREmo solution [50].

6.2.6. Comparing and Bridging Models of Shared Representations and Representation

Sharing Processes

Participant: Alain Giboin.

Context of the work: GDR CNRS Psycho Ergo, Groupe thématique Coopération homme-homme et Coopération homme-machine. Action de recherche RefCom (Référentiel commun), co-leaded with Pascal Salembier (UTT).

Sharing representations or shared representations are often claimed to be a key factor for a collaboration to succeed. The notions of shared representations and representation sharing processes are examined in the research literature from several points of view; this variety of viewpoints gave rise to different conceptualizations, which are referred to using such terms as Common Frame of Reference, Mutual Intelligibility, Shared Context, Team/Situation Awareness, etc. In 2010, in order to achieve mutual intelligibility between researchers working on such conceptualizations, we elaborated and asked participants to the RefCom joint research action to test and to apply a grid for collaboratively comparing and bridging the conceptualizations (see Edelweiss activity report 2010¹³). This year, we analyzed and reported the results of the test and application of the grid [39]. This resulted in a revision of the grid.

6.2.7. Frameworks for taking pragmatic dimensions of ontologies into account

Participant: Alain Giboin.

Context of the work: Follow-up to the Palette European project. This work was done in collaboration with the Centre de Recherche sur l'Instrumentation, la Formation et l'Apprentissage, ULg (Belgium).

When designing ontologies, ontologists (i.e., knowledge engineers specialized in ontology engineering) most often focus on the semantic dimensions of ontologies (such as expressiveness, level of granularity, etc.). Pragmatic dimensions, i.e. dimensions related to the context of use (including the purpose) of the ontologies, are often neglected whereas they are critical to users: ontologies indeed are used in context. In brief, pragmatic dimensions are not taken seriously into account when engineering ontologies but they have to.

We developed a framework to analyze the way we attempted, in the context of the Palette EU project, to contextualize the ontologies underlying a set of semantic knowledge services dedicated to communities of practice. The framework was derived from the *Ontology Framework* elaborated by members of the Ontology Engineering community during the Ontology Summit 2007 [62]. Both frameworks define a series of "pragmatic dimensions" of ontologies. Because our derived framework did not cover all possible dimensions, we complemented it, by relying on existing work from the Ontology Engineering community in general, and from the Pragmatic Web community in particular [16].

6.2.8. Explanation of Semantic Web Query Results

Participants: Rakebul Hasan, Fabien Gandon, Olivier Corby.

¹³<http://raweb.inria.fr/rapportsactivite/RA2010/edelweiss/>

This PhD thesis, directed by Fabien Gandon and Olivier Corby, aims at opening the query-solving mechanism to the users, and handling and explaining the distribution of a query over several sources on the Semantic Web. This work is part of the Kolflow ANR project.

The current Semantic Web search engines are not able to explain how a given query result is obtained or why it has failed to obtain a result. The goal of opening the query-solving mechanism is to enable the Semantic Web query engines to explain the query solving process taking into account the inferences used to obtain the results for a given query. In addition, explanation of the performance indicators of the query-solving process contributes to the understanding of the resolution process. These performance indicators can be effectively used to help in formulating queries by suggesting alternative queries based on the history of the performance of the query-solving process. Another focus of this thesis is on how the distribution of the queries can be performed over the distributed sources and how explanation can be used to better understand the queries and their results over the distributed sources.

In the early stage of this thesis, our current focus is on explaining the Semantic Web query results taking the inferences into account. We are working on justification of results for SPARQL query with RDFS entailment. Our next focus will be on the different abstractions of these justifications with different degree of details and different types of presentations depending on different level of user expertise.

6.2.9. Pervasive Sociality through Social Objects

Participants: Nicolas Marie, Fabien Gandon.

The work is related to semantic spreading activation algorithm, from idea to first results and visualization. Spreading activation is a method for searching semantic networks by labeling a set of initial nodes with weights (called activation), propagating (spreading) that activation out to other nodes linked to the source nodes and iterating propagation. Previously, at the end of 2010, we designed an ontology called OCSO¹⁴. This ontology aims at describing in a structured format social objects (content augmented by social functionalities independently of its nature: video, place, text, etc.) and corresponding social activity. Then, the need of powerful and semantic sensitive algorithm to process such data led us to follow the track of semantic spreading activation.

Two posters were published at IC [42] and Web Science [43] presenting OCSO model and research axis about semantic spreading activation. A state of the art about exploitation of semantics in spreading activation and its position in the general context of this algorithm family was written. Then a formal proposition was made and algorithm development started leading to first experimental results. The state of the art, the formal proposition and early results were published at the Social Objects workshop [41]. The end of the year was mainly focused about results visualization through Gephi and knowledge acquisition on algorithm and its behavior through multiple tests.

7. Contracts and Grants with Industry

7.1. Alcatel Lucent Bell

Participants: Nicolas Marie, Fabien Gandon.

We initiated a Research Contract (CRE) and CIFRE PhD Thesis (2011-2013) on Social objects, object-centered sociality, and object-centered social networks to propose mobile context-based notification application in a semantic and pervasive web. This work will explore spreading algorithms in typed graphs.

7.2. SAP

Participants: Corentin Follenfant, Olivier Corby.

We started a PhD Thesis (Cifre) with SAP Research on *Semantic graphs for decisional information systems*.

¹⁴<http://ns.inria.fr/ocso/V0.2/>

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. AVISICIL : open project, PACA Region

AVISICIL is a 3-years project funded by the PACA Region which complements the ANR project ISICIL. AVISICIL goal (as repositioned in 2010) is to contribute to the design of a system supporting elderly people by recognizing/monitoring their emotions through various sensors. The AVISICIL partners are: the Edelweiss research team; the Kewi research team (I3S Laboratory, UNS, France), and the Laboratoire de Psychologie Cognitive et Sociale (UNS, France). This year, we conducted a social ergonomic study to provide elements of design and evaluation of a system aimed at recognizing the affective states that indicate a loss or maintenance of social ties of elderly people (see section 6.2.5.2).

8.2. National Initiatives

8.2.1. DBpedia.fr

Participants: Julien Cojan, Fabien Gandon.

This project named *DBpedia.fr* proposes the creation of a french version of the DBpedia base used in many applications in english, in particular for the publication of cultural collections. Unfortunately, DBpedia is focused on the english version of Wikipedia and ignores some of the french topics and their data. This projects aims at extracting a maximum of RDF data from the french version of Wikipedia and providing a stable and scalable end-point for them. This project is funded by the Ministry of Culture.

8.2.2. Kolflow

Kolflow is an ANR project (2011-2014), it proposes to extend collective intelligence with smart agents relying on automated reasoning. Smart agents can significantly reduce the overhead of communities in the process of continuously building knowledge. Consequently, continuous knowledge building is much more efficient. Kolflow aims at building a social semantic space where humans collaborate with smart agents in order to produce knowledge understandable by humans and machines.

Partners: INRIA Orpailleur & Edelweiss, Silex U. Claude Bernard Lyon, GDD U. of Nantes

Web site: <http://kolflow.univ-nantes.fr>

8.2.3. DataLift

DataLift is an ANR project (2010-2013). Its goal is to design a platform to publish and interlink datasets on the Web of data. Datalift will both publish datasets coming from a network of partners and data providers and propose a set of tools for easing the datasets publication process. DataLift brings raw structured data coming from various formats (relational databases, CSV, XML, ...) to semantic data interlinked on the Web of Data.

Partners: INRIA Exmo & Edelweiss, LIRMM, Eurecom, Mondeca, Atos, IGN, INSEE, FING

Web site: <http://www.datalift.org>

8.2.4. ISICIL

ISICIL is an ANR project (2009-2012), it proposes to study and to experiment with the usage of new tools to assist corporate intelligence tasks. These tools rely on web 2.0 advanced interfaces (blog, wiki, social bookmarking) for interactions and on semantic web technologies for interoperability and information processing.

Partners: INRIA Edelweiss (Project Leader), Telecom ParisTech, Tech-Cico UTT, Ademe, Orange Labs.

Web site: <http://isicil.inria.fr>

8.3. International Initiatives

8.3.1. Participation In International Programs

8.3.1.1. AUF

The Edelweiss team is partner of an AUF project with University Gaston Berger, Saint-Louis, Senegal. The topic of the project is: Social Semantic Web Platform for Knowledge Sharing in West Africa Communities.

9. Dissemination

9.1. Animation of the scientific community

Olivier Corby

- Reviewer for: ARIMA (Revue africaine de la recherche en informatique et mathématiques appliquées)
- PC member of IC (Journées Francophones d'Ingénierie des Connaissances), JFO (Journées Francophones sur les Ontologies)
- PC member of SIIM (Symposium sur l'Ingénierie de l'Information Médicale)
- PC member of GKR workshop at IJCAI (Graph Structures for Knowledge Representation and Reasoning)
- PC member of MORE-BI (International Workshop on Modeling and Reasoning for Business Intelligence)
- Talk on Corese at Software open day, INRIA Sophia Antipolis-Méditerranée, May 31st
- Talk on Corese at Riviera DEV, October 21st ¹⁵
- Member of W3C SPARQL 1.1 and RDF 1.1 WG

Fabien Gandon

- Invited talk INSA Rouen: Graphes Typés, January 2011
- Invited speaker IHEST (Institut des hautes études pour la science et la technologie, Ministère de l'Enseignement supérieur et de la Recherche): Les quatre aveugles et l'éléphant Web, January 2011
- Invited speaker SPECIF 2011: Web sémantique et Web Social, February 2011
- Invited speaker INFORSID 2011: Web sémantique : données liées et sémantique des schémas, May 2011
- Invited conference at Alcatel Bell Lucent Labs: Supporting knowledge diffusion using typed graphs or the application of the Semantic Web to epistemic communities, June 2011
- Invited conference at LIFO: Web sémantique : données liées et sémantique des schémas, July 2011
- Invited conference at DERI: Supporting knowledge diffusion using typed graphs or the application of the Semantic Web to epistemic communities, August 2011
- Invited panelist of IC 2011 on Characteristics of publications in Knowledge Engineering.
- Invited Speaker Muséologie, muséographie, le web et ses métadonnées: le territoire et sa carte, IRI Paris, Centre Pompidou, October 2011
- Invited Speaker Open World Forum, Open Data needs open standards and open research: an academic and standardization point of view, September 2011
- Reviewer for Journals: AKDM, ISI

¹⁵<http://rivieradev.fr/>

- Reviewer for Conferences: EGC, ESWC, IC, ISWC, SAC, WebScience, WebS, WI, WWW
- Reviewer for: Workshops: COLD, FSWE, GKR, KMC, MARAMI, MSM, MUSE, PhiloWeb, QetR, SDoW, SemWebPro, SocialObjects, SocialComNet, SOS, UWeb, Web Social,
- Scientific animation:
 - Conference: *Un conte des quatre aveugles et l'éléphant web, ou les chroniques d'un Web non documentaire* at INRIA Sophia Antipolis 2011
 - Conference: *Les labyrinthes du web: une histoire dont vous êtes les héros* at INRIA Sophia Antipolis Alumni Jam Session 2011
 - Intervention Fête de la Science, *Conte des quatre aveugles et l'éléphant Web*, at CIV Valbonne, October 2011
 - Conference *Les labyrinthes du web: une histoire dont vous êtes les héros*, Conf'Lunch Rennes November 2011
 - Invited Talk: *Pelote de Web*, June 2011, WILI Seminar

Alain Giboin

- PC member of IS 2011, International Conference on Information Systems 2011, 11 - 13 March 2011, Avila, Spain.
- PC member of IC 2011, 22èmes Journées francophones d'Ingénierie des Connaissances, 16-20 May 2011, Chambéry, France.
- Member of the scientific committee of DeViNT'2011, Neuvième journée "Déficients visuels et NTIC", Sophia Antipolis, France, 26 May, 2011.
- PC member of I-SEMANTICS 2011, The 7th International Conference on Semantic Systems, 7 – 9 September 2010, Graz, Austria.
- PC member of ICPW 2011, The 6th AIS SigPrag International Pragmatic Web Conference Track (ICPW 2011) at the International Conference on Semantic Systems (i-Semantics 2010), 7 - 9 September 2010, Graz, Austria.
- Member of the scientific committee of EPIQUE 2011, Xème Colloque de Psychologie ergonomique, 5-7 September, 2011, Metz, France.
- PC member of COGNITIVE 2011, The Third International Conference on Advanced Cognitive Technologies and Applications, 25-30 September, 2011 - Rome, Italy.
- Co-chair (with Emmanuel Dubois, IRIT) of the Short Papers of IHM 2011, The 23th French-speaking Conference on Human-Computer Interaction / 23ème Conférence francophone sur l'Interaction Homme-Machine, 24-27 October 2011, Sophia Antipolis, France.
- Non-Board Member Referee of the bilingual and multidisciplinary journal in human factors *Le Travail Humain*.
- Reviewer for the International Journal of Human-Machine Studies.
- Reviewer for the ANR CONTINT program.
- Group *Grape, Psychologie ergonomique* of the Département Recherche de la Société française de Psychologie (SFP) : Alain Giboin is Founder member of this group.
- GDR CNRS *Psycho Ergo*: Edelweiss is a member of this GDR. Alain Giboin is a member of the GDR Council, and the coordinator (with Pascal Salembier, UTT Troyes) of the Thematic Group *Coopération homme-machine et Coopération homme-homme*.
- Member of the organizing committee of the Overview and Perspectives Colloquium of the *GDR Psycho Ergo* Research Network / Colloque de Synthèse et Perspectives du GDR Psycho Ergo, 4-6 April, 2011, Toulouse, France.

- Member of the organizing committee of DeViNT'2011, Neuvième journée "Déficients visuels et NTIC", Sophia Antipolis, France, 26 May, 2011.
- Co-organizer (with Yannick Prié, LIRIS) of the Workshop *Interacting with Formal Representations / Atelier Interagir avec des représentations formelles*, in conjunction with IHM 2011, The 23th French-speaking Conference on Human-Computer Interaction / 23ème Conférence francophone sur l'Interaction Homme-Machine, 24 October 2011, Sophia Antipolis, France.
- Co-chair (with Philippe Renevier, I3S) of the organizing committee of IHM 2011, The 23th French-speaking Conference on Human-Computer Interaction / 23ème Conférence francophone sur l'Interaction Homme-Machine, 24-27 October 2011, Sophia Antipolis, France.
- Invited speaker: *Vers une autre compréhension du rapport homme-machine : faut-il imaginer l'utilisateur heureux ?*, Les Conférences du Centre Universitaire Méditerranéen, Cycle Actu-Philo *Et si le bonheur était possible ?*, Nice, France, 3 February, 2011.
- Invited discussant (with Pascal Salembier, UTT) of the seven papers presented during the Journée d'étude *Analyse de l'activité collective : quelles méthodes pour quels objets ?* organized by the French *Réseau des Jeunes Chercheurs en Ergonomie*, Paris, 28 March, 2011.

Isabelle Mirbel

- Program Chair of IFIP WG8.1 Working Conference on Method Engineering, April 2011, Paris.

Serena Villata

- Tutorial on *Argumentation for Agent Societies* (4h) at the European Agent Systems Summer School, EASSS 2011
- Tutorial chair of the 14th International Conference on Principles and Practice of Multi-Agent Systems (PRIMA 2011)
- PC member of the Journal of Logic and Computation
- PC member of International Joint Conference on Artificial Intelligence, IJCAI 2011
- PC member of 1st International Workshop on the Theory and Applications of Formal Argumentation, TAFE 2011
- PC member of Social Networks and Multi Agent Systems, SNAMAS 2011

Maxime Lefrançois

- Member of the Ontology-Lexica W3C Community Group.

9.2. Teaching

Semantic Web: 36h. L2, IUT Nice UNS, France.

Participants: Olivier Corby, Catherine Faron-Zucker, Fabien Gandon.

Semantic Web: 45h. Master 2, IFI KIS PolyTech Nice, UNS, France.

Participants: Olivier Corby (Responsible), Catherine Faron-Zucker, Fabien Gandon.

Semantic Web Standards: 30h. Master 2, University Gaston Berger, Saint-Louis, Senegal.

Participants: Fabien Gandon, Olivier Corby.

Introduction to the Semantic Web: 2h. Master 2, Ecole Centrale de Paris, France.

Participant: Fabien Gandon.

Introduction to the Web: 12h. Licence 1, UNS, France.

Participant: Serena Villata.

Knowledge Engineering: 45h. Master 2, IFI KIS PolyTech Nice, UNS, France.

Participants: Olivier Corby, Catherine Faron-Zucker, Fabien Gandon, Alain Giboin.

Man Machine Interaction: 30h. Master 2, GUI PolyTech Nice, UNS, France.

Participant: Alain Giboin.

A paper presented at the IHM 2011 conference reports an experience feedback of this course on GUI in terms of transfer of knowledge and technology from research and industry to the training of future HCI specialists ([34]).

Task and Activity Analysis: 6h. Master 2, *Sociology and Ergonomics of Digital Technologies*, UNS France.

Participant: Alain Giboin.

Object Oriented Design: UML& OCL: 18h. Licence 3, UNS, France.

Participant: Maxime Lefrançois.

Enterprise Components Architecture: Java EE 6, EJB 3.1, JSF 2.0: 12h. M2 MIAGE, UNS, France.

Participant: Maxime Lefrançois.

Design and Development of Information Systems for the Internet: Web 2.0: 10h. M2 MIAGE, UNS, France.

Participant: Maxime Lefrançois.

9.2.1. PhD & HdR

PhD : Guillaume Erétéo, *Semantic Social Network Analysis*, Telecom ParisTech, April 11th, 2011, director: Fabien Gandon, [14].

PhD in progress : Adrien Basse, *Distributed Query Processing*, directors: Fabien Gandon, Moussa Lo.

PhD in progress : Luca Costabello, *Mobile Access to the Web of Data*, directors: Fabien Gandon, Ivan Herman.

PhD in progress : Corentin Follenfant, *Usage semantics of analytics and Business Intelligence tools*, directors: David Trastour (SAP), Olivier Corby, Fabien Gandon.

PhD in progress : Rakebul Hasan, *Explanations for Social Semantic Web*, director: Fabien Gandon.

PhD in progress : Maxime Lefrançois, *Collaborative multilingual management of interlingual knowledge bases*, directors: Fabien Gandon, Christian Boitet.

PhD in progress : Nicolas Marie, *Pervasive sociality through social objects*, directors: Miryam Ribière (Alcatel Bell Lucent), Fabien Gandon, Ivan Herman.

PhD in progress : Oumy Seye, *Rules for the web of Data*, directors: Olivier Corby, Catherine Faron-Zucker.

9.2.2. Jury Member

Fabien Gandon was Jury member of PhD:

- Florie Bugeaud: *iSamsara : pour une Ingénierie des Systèmes de Services à base de Méréologie et d'Hypergraphes*, Université de Technologie de Troyes, July.
- Sheila Kinsella: *Augmenting Social Media Items with Metadata using Related Web Content*, DERI, University Galway, Ireland, August.
- Jérémie Doucy: *Méthodologie pour l'orchestration sémantique de services : Définition et implémentation d'une plateforme sémantique de traitement de documents multimedia*, INSA de Rouen, October.
- Johann Stan: *A Semantic Framework for Social Search*, University of Lyon, Université Jean-Monnet, November.
- Pierre-Yves Vandenbussche: *Définition d'un cadre formel de représentation des Systèmes d'Organisation de la Connaissance*, Université Pierre et Marie Curie - Paris VI, November.

9.2.3. Internship

- **Mouhamadou Ba:** Information Retrieval Portal for ISICIL project. Master 2, U. Gaston Berger, Saint-Louis, Senegal.
- **Neji Bouchiba:** *Vers un intermédiaire numérique capteur d'émotions pour le maintien du lien social chez les personnes âgées : Contributions socio-ergonomiques*, director: Alain Giboin.
- **Soda Cisse:** Management and Visualization of Communities in the ISICIL project. Master 2, U. Gaston Berger, Saint-Louis, Senegal.
- **Dora Daniluc:** Design of an Implementation of R2RML ¹⁶, Master 1, Miage UNS.
- **Amélie Gyrard:** *Droits d'accès aux ressources au sein d'un réseau social à l'aide du Web Sémantique* director: Fabien Gandon.
- **Nemanja Vukosavljevic:** Framework for Social Tagging and Bookmarking. Master 2, U. Paris Sud (Paris XI).

10. Bibliography

Major publications by the team in recent years

- [1] O. CORBY. *Web, Graphs & Semantics*, in "Proc. of the 16th International Conference on Conceptual Structures (ICCS'2008)", Toulouse, July 2008, p. 43-61.
- [2] O. CORBY, R. DIENG-KUNTZ, C. FARON-ZUCKER. *Querying the Semantic Web with Corese Search Engine*, in "Proc. of the 16th European Conference on Artificial Intelligence (ECAI'2004), Prestigious Applications of Intelligent Systems", Valencia, Spain, R. L. DE MANTARAS, L. SAITTA (editors), August 22-27 2004, p. 705-709.
- [3] O. CORBY, R. DIENG-KUNTZ, C. FARON-ZUCKER, F. GANDON. *Searching the Semantic Web: Approximate Query Processing based on Ontologies*, in "IEEE Intelligent Systems & their Applications", January-February 2006, vol. 21, n^o 1, p. 20-27.
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