



Activity Report 2011

Project-Team **AXIS**

Usage-centered design, analysis and
improvement of information systems

RESEARCH CENTERS
Sophia Antipolis - Méditerranée
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THEME
**Knowledge and Data Representation
and Management**

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Project-Team AXIS

Keywords: Data Mining, Knowledge Engineering, Social Networks, User Interface, Sensors

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2. Overall Objectives

2.1. Presentation

AxIS is carrying out research in the area of Information and Knowledge Systems (ISs) with a special interest in evolving large ISs such as Web-based Information Systems. Our **core goal** is to provide knowledge, methods and tools to support better design, evaluation and usage in the digital world, i.e. to improve the overall quality of ISs, to ensure ease of use to end users and also to contribute to user-driven open innovation as a way to foster innovation,

Our researches are organized to support the disruptive process of continuous innovation in which design is never ended and relies on very short test-adapt-test cycles. According to the constant evolution of actual and future ISs, to reach this goal, it is necessary to involve the users in the design process and to empower them, so that they can become codesigners as co-creators of value. This is a new way to anticipate the usage and its analysis and also to consider maintenance very early in the design process.

To achieve such a research, we have set up in July 2003 a multidisciplinary team that involves people from different computer sciences domains (Data Mining & Analysis, Software Engineering) and from cognitive sciences domains (Ergonomics, Artificial Intelligence), all of them focusing on information systems. Our goal is of course to improve **efficiency of data mining methods** but also to improve the **quality of results** for knowledge discovery in information systems. The originality of AxIS project-team is to adopt a cognitive and inter-disciplinary approach for the whole KDD¹ process and for each step (preprocessing, data mining, interpretation).

To address this challenge, relying on our scientific foundations (see our 2007 activity report, Section Scientific Foundations), we had a first 4 years step dedicated to the design of methodological and technical building blocks for IS mining (usage, content and structure) mainly in Web mining. The next four years were dedicated to provide original methods in mining data streams and evolutive data in the context of Web but also in sensor based applications and to prepare the dissemination of our methods and tools inside the FocusLab experimental platform whose goal is to support the analysis of individual and collective user experience.

In this context, our team focused its effort on the technical and methodological environment needed to extract meaning from the huge amount of data issued from large and distributed information systems. Our ultimate goal is fed by research contributions from the three sub-objectives below:

1. **Sub-objective 1 - Mining for Knowledge Discovery in Information Systems** : Concerning Data Mining the specificity of our research is in two areas: methods and data. In traditional applications, a data mining process assumes that data to be mined is stored in a database with seldom (non frequent) updates. The extraction might take days, weeks, or even months, but due to the static nature of data, knowledge extraction can easily be deployed. When dealing with data streams, one only gets one look at data, which it changes over time. Due to the growing number of such emerging applications, the advanced analysis and mining of data streams is becoming more and more important, and it receives a great deal of attention. Mining data streams remains very challenging, because traditional data mining operations are impossible on data streams. Since data streams are continuous, high speed and unbounded, it is impossible to use traditional algorithms that require multiple scans.

¹KDD: Knowledge Discovery From Databases

In traditional Data Mining applications the representation of the data is a vector of R^p where p is the number of descriptors. In Web Mining the navigation must be represented by a ordered list of R^p vectors and it's not easy to reduce this representation by one vector. At the start of AxIS the main challenge was to study different representations of the objects with the objective that the complex representation is closed to the initial representation. We proposed different not vectorial representations, called complex data. The main subject matters in sub-objective 1 are data stream mining, complex data clustering, semantics and ontologies checking.

2. **Sub-objective 2 - Information and Social Networks Mining for supporting Information Retrieval** : our main subject matters are clustering methods for identifying communities inside social networks, expert finding and entity retrieval in Wikipedia. At the end of the nineties and in the early new millennium, many clustering methods have been adapted to the context of relational data sets (k-means approach and SOM by Hathaway, Davenport and Bezdek (1982, 2005), a divisive clustering by Girvan and Newman (2002), EM and Bayesian approaches by Handcock, M.S., Raftery, A.E. and Tantrum, J. (2007). The units are connected by a link structure representing specific relationships or statistical dependencies, the clustering task becomes a means for identifying communities within networks. Graphs are intuitive representations of networks. Related to information retrieval, we managed two problems: expert finding whose goal is to identify persons with relevant experience from a given domain and entity extraction.

3. **Sub-objective 3 - Multidisciplinary Research For supporting user oriented innovation** :

With the last Web 2.0 technology developments of cloud computing, the improvement of web usability and web interactivity through rich interface, Ajax, RSS and semantic web, the concept of CAI 2.0 is currently a major topic. In addition, HCI design and evaluation focus is no longer placed on usability but on the whole user experience. Experimentations take place out of lab with large number of heterogeneous people instead of carefully controlled panels of users. These deep changes require to adapt existing methodologies and design new ones. So, to address these new requirements, we identified the following research :

- conceptual studies (cf. 5.4.2, 5.4.3, 5.4.4): state-of-the-art investigations covering the Living Lab landscape, the future internet domain landscape, the future user-open innovation for smart cities. These studies provide insight on methodological aspects for needs analysis, data gathering, evaluation, design, innovation methods.
- Improvement of existing methods or elaboration of New methods and tools for usage analysis of CAI 2.0 tools. For instance:
 - a) Extension of methods for idea generation processes (cf. 5.4.6)
 - b) Method and tool for selection of open innovation software tools (cf. 5.4.5)
 - c) usability methods: coupling usability design methods with data mining techniques, evaluation methods (cf. 5.4.1)

FocusLab Experimental Platform (CPER Telius) (cf. 5.5.2) is our delivery mechanism providing access to AxIS methodology and software for the scientific community;

All our research work (data and methods) is mainly either extracted, tested, or applied in the context of Living Labs (cf. 3.1).

2.2. Highlights

1. A best paper at ECIR the major european conference on Information Retrieval and an article accepted [23] in *Pattern Recognition* journal (Elsevier).
2. AxIS has contributed to the Future Internet Assembly book on *Smart Cities and Future Internet: towards cooperation frameworks for Open innovation* [39].
3. An important effort has been done this year to get datasets from real applications in order

- to validate our methods in data mining: it was the case for our ATWUEDA method applied on electric power plant curves from EDF [51],.
 - to support our researches in expert finding with the important work of E. Smirnova in building experiment dataset based on the LinkedIn repository (cf. her visit at Intelius, USA) and with the Yahoo! agreement which allows us to get a large sample of the web graph, important for our work on name disambiguation,
 - and to consolidate and support our multi-disciplinary approach in understanding usage data, user experience and co-creation (methodology and data mining) by the data generated from several projects involving experiments with citizen (cf. 6.1).
4. SCDS method from Marascu's thesis (2009) has been implemented as a Web service inside the FocusLab platform and was used for ELLIOT purposes (cf. 4.2.3). ATWUEDA has been applied successfully for system monitoring purposes at EDF.
 5. AxIS Rocquencourt and AxIS Sophia Antipolis have worked on two common Pacalabs contracts (Ecoffices, an energetical challenge and HOTEL-REF-PACA related to the log analysis of Web sites referencing).
 6. Fruitful relations established with the urban community of Nice Cote d'Azur (NCA) and the urban community of Antibes Sophia Antipolis in the context of various projects.
 7. AxIS staff has prepared the evaluation of our past four years and our future research as our colleagues from the same topic "Perception, Cognition, Interaction: Knowledge and Data Representation and Management" in october 12-13 (our last evaluation was in november 2007).

BEST PAPERS AWARDS :

[43] the 33rd European conference on Advances in information retrieval. E. SMIRNOVA, K. BALOG.

3. Application Domains

3.1. Panorama: Living Labs, Smart Cities

AxIS addresses transversal domains i.e any ICT based innovation project which adopts a living lab approach or has one of the following features

a) requiring individual or collective usage data storage, preprocessing and analysis tools

- for designing, evaluating and improving huge evolving hypermedia information systems (mainly Web-based ISs), for which end-users are of primary concern,
- for a better understanding of the usage of services/products by data mining techniques and knowledge management
- for social network analysis (for example in Web 2.0 applications, Business Intelligence, Sustainable Development, etc.): see past work in ANR Intermed (2009) or current contracts such as FP7 ELLIOT [cf. section 6.3.1.1) where citizen generate ideas in terms of specific environmental sensors based services according to their needs.

and b) requiring user-driven innovation methods or tools: a first work was made in 2010 during the CDISOD Color action for supporting the design of innovative services by citizen from public data in collaboration with Fing (Marseille) and Ademe (Sophia Antipolis). We pursue such a study in the context of FP7 ELLIOT related to environmental data (air quality and noise).

Even if our know how, methods and algorithms have a cross domain applicability, our team chooses to focus on **Living Lab** projects and mainly related to **Sustainable Development for Smart Cities** which imply user involvement the future services/products.

Indeed, following the Rio Conference (1992) and the Agenda for the 21st Century, local territories are now directly concerned with the set up of actions for a sustainable development. In this frame, ICT tools are supposed to be very efficient to re-engage people in the democratic process and to make decision-making more transparent, inclusive and accessible. So, sustainable development is closely associated with citizen participation. The emerging research field of e-democracy (so called Digital Democracy or eParticipation), concerned with the use of communications technologies such as the Internet to enhance the democratic processes is now a very active field. Though still in its infancy, a lot of literature is already available (see for instance: <http://itc.napier.ac.uk/ITC/publications.asp> or <http://www.demo-net.org/> for a global view of work in Europe) and numerous different topics are addressed in the field.

We have some experience, particularly stressed on the following applicative domains:

- Transportation systcd RA2011/axis-thierry4 grep top(-kems & Mobility (cf. section 3.2),
- Tourism (cf. section 3.3),
- Others domains such as Environment, Energy, Well Being & Health and e-Government (cf. section 3.4).

3.2. Transportation Systems & Mobility

Major recent evolutions in Intelligent Transportation Systems (ITS) are linked to rapid changes in communication technologies, such as ubiquitous computing, semantic web, contextual design. A strong emphasis is now put on mobility improvements. These improvements concern both the quality of traveller's information systems for trip planning, the ability to provide real time recommendations for changing transportation means according to traffic information, and the quality of embedded services in vehicles to provide enhanced navigation aids with contextualised and personalised information.

Web 2.0 technology plays now a role of growing importance, as it supports users feed-back which becomes a mean for improving quality of travelers information sytems. Exchange of information between users about delay, cancellation and other occurring events provides more accurate and precise data on the current state of the transportation system.

Let us cite various projects where AxIS was and is still involved:

- **Mining Mobility Data**, PREDIT (2004-2007): the MobiVIP project has been an opportunity to collaborate with local Institutions (Communauté d'Agglomération de Sophia Antipolis - CASA) and SMEs (VU Log) and apply AxIS know-how in mining spatial and temporal data issued from vehicules equipped with GPS and from the reservation server and in clustering trajectories (with semantic distances). Even if we didn't apply our know how in mining data streams in this project, this will be crucial in the future with more and more vehicules equipped with GPS.
- **Traveller's Information Systems** - evaluation of two Web sites (2007-2008):
 - the Envibus web site provides information about a bus network ; its evaluation was done by coupling ergonomic analysis and usage mining
 - the Otto&co web site supporting car-sharing. Our cooperation about car-sharing developed in 2008 with an evaluation of the Otto&co site in the context of the action COLOR Cuscov is still lasting.
- **Advanced Transportation Systems** - Multimodality, PREDIT (2010-2012): the TIC TAC project (cf. 8.1.7) aims to optimize travel time by providing, in an area with weak transportation services, a just in time on demand shuttle, based on real time information.

3.3. Tourism

As tourism is a highly competitive domain, local tourism authorities have developed Web sites in order to promote their services to tourists. Unfortunately, the way information is organised does not necessarily meet Internet users expectations and numerous improvements are necessary to enhance their understanding of visited sites. Thus, even if only for economical reasons, the quality and the diversity of tourism packages have to be improved, for example by highlighting cultural heritage.

Again to illustrate our role in such a domain, let us cite some past projects where AxIS was involved and relating mainly to **Semantic Web Mining**². In our case, we exploit a) ontologies and semantic data for improving usage analysis, personalised services, quality of results of search engines and checking the content of an IS and also b) we exploit usage data for updating ontologies.) and **Information Retrieval**.

- Research has been carried out using log files from the city of Metz. This city was chosen because its Web site is in constant development and has been awarded several times, notably in 2003, 2004 and 2005 in the context of the Internet City label. The objective was to extract information about tourists behaviours from this site log files and to identify possible benefits in designing or updating a tourism ontology.
- Providing Tourism Information linked to Transportation information: AxIS has already studied recommender systems in order to provide users with personalised transportation information while looking for tourism information such as cultural information, leisure etc (cf. our recommender *Be-TRIP* (2006)) and [87].
- the Pacalabs (call 2) called HOTEL-REF-PACA accepted in 2010 aims to better refer the web sites of hotels/campings involved in the TOURVAL project (France-Italy) managed by the General Council of Alpes Maritimes, with an approach based on a better understanding of usage from the internauts.

3.4. Other domains: Energy, Environment, Health and e-Government

This year we started specific work on user involvement in the three following domains:

- **Energy** (cf. section 6.1.3): the main AxIS topic here is **usage analysis** in the context of an eco-challenge within an enterprise which is a difficult task due to the complex situation (installation of more than 400 sensors, various differences between the three concerned teams). Such an analysis aims to correlate energy consuming, team eco-responsible behaviours and team profiles.
- **Health** (cf. section 6.2.6): **Living Lab characterisation in Health domain**: AxIS contributed to such a characterisation through the visit (M. Pallot) of several Living Labs, which operate in the domain of Health and Autonomy, and conducted interviews. This work was done in relation with the CGIET³ (cf. section 6.2.6).
- **e-Gov** (cf. section 6.2.5: **Personal Information Management System in e-gov**): The future Internet will bring a growing number of networked applications (services), devices and individual data (including private ones) to end-users. The important challenges are the organization of their access, and the guarantee of trust and privacy. The objectives of the PIMI⁴ project are the definition of a design environment and a deployment platform for Personal Information Management system (PIM). The future PIM must provide the end-user personal data access with services that are relevant to his needs. In order to take mobility into account, the PIM will be accessed both by mobile devices (smartphone) and Personal Computers. With the increasing number of services and associated data being accessible through Internet, the number and complexity of PIM will raise dramatically in the near future. This will require strong research investment in a number of topics, all contributing to the expected usability and accessibility of Individual Information Spaces for the end-user.

4. Software

4.1. Introduction

From its creation, AxIS has proposed new methods, approaches and **software** validated experimentally on various applications: Data Mining, Web usage Mining, Information Retrieval, Activity Modeling.

²By Semantic Web Mining, we mean the mutual benefits between two communities Semantic Web and Web Mining

³CGIET is the High Council for Industry, Energy and technology, created in Feb 2009 and chaired by the Minister in charge of economic affairs

⁴Personal Information Management through Internet

Some of our results are under process to be part of the FocusLab platform (CPER Télius 5.5.2) which is based on a Service oriented Architecture. The development process has started this year, finding ways to fund human resources. Such a platform aims the community of Living Labs domain.

4.2. Data Mining

4.2.1. Classification and Clustering Methods

Participants: Marc Csernel, Yves Lechevallier [co-correspondant], Brigitte Trousse [co-correspondant].

We developed and maintained a collection of clustering and classification software, written in C++ and/or Java:

Supervised methods

- a Java library (Somlib) that provides efficient implementations of several SOM (Self-Organizing Map) variants [87], [86], [106], [105], [110], especially those that can handle dissimilarity data (available on Inria's Gforge server (public access) <https://gforge.inria.fr/projects/somlib/>, developed by AxIS Rocquencourt and Briec Conan-Guez from Université de Metz.
- a functional Multi-Layer Perceptron library, called FNET, that implements in C++ supervised classification of functional data [101], [104], [103], [102] (developed by AxIS Rocquencourt).

Unsupervised methods : partitioning methods

- two partitioning clustering methods on the dissimilarity tables issued from a collaboration between AxIS Rocquencourt team and Recife University, Brazil: CDis and CCClust [111]. Both are written in C++ and use the "Symbolic Object Language" (SOL) developed for SODAS. And one partitioning method on interval data (Div).
- two standalone versions improved from SODAS modules, SCluster and DIVCLUS-T [84] (AxIS Rocquencourt).

Unsupervised methods : agglomerative methods

- a Java implementation of the 2-3 AHC (developed by AxIS Sophia Antipolis). The software is available as a Java applet which runs the hierarchies visualization toolbox called HCT for Hierarchical Clustering Toolbox (see [85]).

A Web interface developed in C++ and running on our Apache internal Web server is available for the following methods: SCluster, Div, yCdis, CCClust.

Previous versions of the above software have been integrated in the SODAS 2 Software [98] which was the result of the european project ASSO⁵ (2001-2004). SODAS 2 softsodaslinkware supports the analysis of multidimensional complex data (numerical and non numerical) coming from databases mainly in statistical offices and administration using Symbolic Data Analysis [82]. This software is registered at APP. The latest executive version of the SODAS 2 software, with its user manual can be downloaded at <http://www.info.fundp.ac.be/asso/sodaslink.htm> [88], [112].

4.2.2. Extracting Sequential Patterns with Low Support

Participant: Brigitte Trousse [correspondant].

Two methods for extracting sequential patterns with low support have been developed by D. Tanasa in his thesis (see Chapter 3 in [108] for more details) in collaboration with F. Masseglia and B. Trousse :

- **Cluster & Divide** [108]
- and **Divide & Discover** [13], [108].

⁵ASSO: Analysis System of Symbolic Official data

4.2.3. Mining Data Streams

Participants: Brigitte Trousse [correspondante], Mohamed Gaieb.

In Marascu's thesis (2009) [95], a collection of software have been developed for knowledge discovery and security in data streams. Three **clustering methods for mining sequential patterns (Java) in data streams** method have been developed in Java:

- SMDS compares the sequences to each others with a complexity of $O(n^2)$.
- SCDS is an improvement of SMDS, where the complexity is enhanced from $O(n^2)$ to $O(n.m)$ with n the number of navigations and m the number of clusters.
- ICDS is a modification of SCDS. The principle is to keep the clusters' centroids from one batch to another.

Such methods take batches of data in the format "Client-Date-Item" and provide clusters of sequences and their centroids in the form of an approximate sequential pattern calculated with an alignment technique.

In 2010 the Java code of one method called SCDS has been integrated in the MIDAS demonstrator (cf. 6.2.1) and a C++ version has been implemented by F. Maseglia for the CRE contract with Orange Labs with the deliverability of a licence) with a visualisation module (in Java).

It has been tested on the following data:

- Orange mobile portal logs (100 million records, 3 months) in the context of Midas project (Java version) and the CRE (Orange C++ version)
- Inria Sophia Antipolis Web logs (4 million records, 1 year, Java version)
- Vehicle trajectories (Brinkhoff generator <http://iapg.jade-hs.de/personen/brinkhoff/generator/> in the context of MIDAS project (Java version)

This year it has been integrated as a Web service (Java version) in the first version of FocusLab platform in the ELLIOT context (cf. 5.5.2): a demonstration was made on San Raffaele Hospital media use case at the first ELLIOT review at Brussels (cf. 6.3.1.1).

4.3. Web Usage Mining

4.3.1. AWLH for Pre-processing Web Logs

Participants: Yves Lechevallier [co-correspondant], Brigitte Trousse [co-correspondant].

AWLH (AxIS Web Log Preprocessing and Data Stream extraction) for Web Usage Mining (WUM) is issued from AxISlogminer preprocessing software which implements the mult-site log preprocessing methodology developed by D. Tanasa in his thesis [16] for Web Usage Mining (WUM). In the context of the Eiffel project (2008-2009), we isolated and redesigned the core of AxISlogMiner preprocessing tool (we called it AWLH) composed of a set of tools for pre-processing web log files. AWLH can extract and structure log files from several Web servers using different input format. The web log files are cleaned as usually before to be used by data mining methods, as they contain many noisy entries (for example, robots bring a lot of noise in the analysis of user behaviour then it is important in this case to identify robot requests). The data are stored within a database whose model has been improved.

Now the current version of our Web log processing (Available on INRIA's gforge website with private access) offers:

- Processing of several log files from several servers,
- Support of several input formats (CLF, ECLF, IIS, custom, ...);
- Incremental pre-processing;
- Java API to help integration of AWLH in external application.

An additional tool has been developed for capturing user actions in real time based on an open source project called "OpenSymphony ClickStream". An extension version of AWLH called **AWLH-Debate** has been developed for recording and structuring data issued from annotated documents inside discussion forums.

4.3.2. *ATWUEDA for Analysing Evolving Web Usage Data*

Participants: Yves Lechevallier [correspondant], Brigitte Trousse, Mohamed Gaieb, Yves Lechevallier.

ATWUEDA for Web Usage Evolving Data Analysis [90] was developed by A. Da Silva in her thesis [89] under the supervision of Y. Lechevallier. This tool was developed in Java and uses the JRI library in order to allow the application of R which is a programming language and software environment for statistical computing <http://www.r-project.org/> functions in the Java environment.

ATWUEDA is able to read data from a cross table in a MySQL database. It splits the data according to the user specifications (in logical or temporal windows) and then applies the approach proposed in the Da Silva's thesis in order to detect changes in dynamic environment. The proposed approach characterizes the changes undergone by the usage groups (e.g. appearance, disappearance, fusion and split) at each timestamp. Graphics are generated for each analyzed window, exhibiting statistics that characterizes changing points over time.

Version 2.0 available at INRIA's gforce website: <http://gforge.inria.fr/projects/atwueda/> (public access, documentation september 2009).

This year we have demonstrated the efficiency of ATWUEDA [51] by applying it on another real case study on condition monitoring data streams of an electric power plant provided by EDF (cf. section 5.5.1).

ATWUEDA is used by Telecom Paris Tech and EDF [51].

4.4. Information Retrieval

4.4.1. *CBR*Tools for Managing and Reusing Past Experiences based on Historical Data*

Participant: Brigitte Trousse [correspondant].

CBR*Tools [92], [93] is an object-oriented framework [94], [91] for Case-Based Reasoning which is specified with the UMT notation (Rational Rose) and written in Java. It offers a set of abstract classes to model the main concepts necessary to develop applications integrating case-based reasoning techniques: case, case base, index, measurements of similarity, reasoning control. It also offers a set of concrete classes which implements many traditional methods (closest neighbors indexing, Kd-tree indexing, neuronal approach based indexing, standards similarities measurements). CBR*Tools currently contains more than 240 classes divided in two main categories: the core package for basic functionality and the time package for the specific management of the behavioral situations. The programming of a new application is done by specialization of existing classes, objects aggregation or by using the parameters of the existing classes.

CBR*Tools addresses application fields where the re-use of cases indexed by behavioral situations is required. The CBR*Tools framework was evaluated via the design and the implementation of several applications such as Broadway-Web, Educaid, BeCKB, Broadway-Predict, e-behaviour and Be-TRIP.

CBR*Tools is concerned by two past contracts: EPIA and MobiVIP.

CBR*Tools will be available for research, teaching and academic purpose via the FocusLab platform. The user manual can be downloaded at the URL: <http://www-sop.inria.fr/axis/cbrtools/manual/>.

See also the web page <http://www-sop.inria.fr/axis/cbrtools/manual/>.

4.4.2. *Broadway*Tools for Building Recommender Systems on the Web*

Participant: Brigitte Trousse [correspondant].

Broadway*Tools is a toolbox supporting the creation of adaptive recommendation systems on the Web or in a Internet/Intranet information system. The toolbox offers different servers, including a server that computes recommendations based on the observation of the user sessions and on the re-use of user groups' former sessions. A recommender system created with Broadway*tools observes navigations of various users and gather evaluations and annotations, to draw up a list of relevant recommendations (Web documents, keywords, etc).

Based on Jaczynski's thesis [92], different recommender systems have been developed for supporting Web browsing, but also browsing inside a Web-based information system or for query formulation in the context of a meta search engine.

4.5. Activity Modeling

4.5.1. K-MADe for Describing Human Operator or User Activities

Participant: Dominique Scapin [correspondant].

K-MADe tool (Kernel of Model for Human Activity Description Environment). The K-MADe is intended for people wishing to describe, analyze and formalize the activities of human operators, of users, in environments (computerized or not), in real or simulated situation; in the field, or in the laboratory. Although all kinds of profiles of people are possible, this environment is particularly intended for ergonomics and HCI (Human Computer Interaction) specialists. It has been developed through collaboration between ENSMA (LISI XSLaboratory) and INRIA. The last release was delivered on November 1st 2010 based on the work of Caffiau and al. [83].

Its history, documentation and tool are available at: <http://kmade.sourceforge.net/index.php>

5. New Results

5.1. Introduction

This year we obtained new results in our three sub-objectives and also related to Focuslab platform and software valorization.:

1. **Sub-objective 1 - Mining for Knowledge Discovery in Information Systems:** this we get five results (with one achieved PhD thesis).

Let us note that six past works on this sub-objective described in previous AxIS annual reports have been published this year as articles in international journals ([22],[11]) or conferences, one in a national journal [50], two in a french-speaking conference [35], [46], one book [20] and one book chapter [52] at international level. Indeed

- The work in 2009 on mining data streams by Marascu in her thesis [96] has been published in [11] with more details in the algorithms and in the experiments.
- The work published in 2008 on discovering frequent behaviors [107] has been published in [22] with more details in the algorithms and in the experiments.
- An article based on Charrad's thesis (2010) related to bipartitioning methods applied on Web site analysis (2010) has been published this year [20] as well as her thesis as a book [50].
- Our previous work on satellite image mining in 2010 [99] has been published in French at EGC [35].
- Our past work on Functional data analysis involving data described by regular functions rather than by a finite number of real valued variables has been published as a scientific book chapter [52]. In this paper we propose to use a clustering approach that targets variables rather than individual to design a piecewise constant representation of a set of functions. The contiguity constraint induced by the functional nature of the variables allows a polynomial complexity algorithm to give the optimal solution.

- In the context of the WRUM project (Morocco) and Zemmouri's PhD thesis, we have a long paper accepted at JFO 2011 related to past works (2010) on how to integrate domain knowledge in a multi-view KDD process [46].
- 2. **Sub-objective 2 - Information and Social Networks Mining for Supporting Information Retrieval:** Three results (with one achieved Ph-D thesis). Let us remind the best paper [15] obtained By E. Smirnova at ECIR 2011 for her research on expert finding.
- 3. **Sub-objective 3 - Multidisciplinary Research For Supporting User Oriented Innovation:** this interdisciplinary research is dedicated to the design, tailoring and refinement of methodologies and tools for a better users' involvement in innovation processes. We have seven results this year..

Concerning our activity in terms of **FocusLab Experimental Platform and Software**, a) we first applied ATWUEDA on another context of evolutive data (on system monitoring data at EDF) which is different of Web usage data) to show the genericity of the approach [9], and b)we develop a Web-based version of the FocusLab experimental platform for analysis usage data (hardware and software parts).

5.2. Mining for Knowledge Discovery in Information Systems

5.2.1. Mining Data Streams: Clustering and Pattern extraction

Participant: Chongsheng Zhang.

In Zhang's thesis [19] (supervised by F. Masegla), which was partially founded by ANR MIDAS (cf. 6.2.1), we present our study of the management and mining issues on data streams with evolving tuples, caused by model updates or tuple revisions. For instance, in an online auction system where bids on auction items are streaming, it is possible that some users may bid for more than one item within the user-specified time interval. As a result, the profiles of the users can be updated or revised in such applications. Data streams having evolving tuples bring new challenges as well as research opportunity. In this work, he develops novel and efficient models and methods for managing and mining data streams with evolving tuples. (I) To model data streams with evolving tuples, we propose the Anti-Bouncing Streaming model (ABS) for usage streams. ABS fits data streams with evolving tuples and it enables methods for processing of data streams to handle tuple updates or revisions. (II) To find frequent itemsets from data streams with evolving tuples over pane-based sliding windows, we conduct theoretical analysis and propose theorems which can avoid scanning the past slides to check for possible itemsets that may become frequent. We also design novel data structures which can manage the data streams with evolving tuples efficiently and facilitate the mining of frequent itemsets. Moreover, we devise an efficient counting algorithm to verify the frequentness of the candidate frequent itemsets. We also propose two running frameworks for this problem. (III) To extract important feature set from data streams (including the ones with evolving tuples), based upon ABS, we devise the streaming feature set selection algorithm for data streams which is the first in the literature. This method is based on information theory to extract the informative feature sets. To further accelerate the extraction of the most informative feature set from high-dimensional data, we propose a framework that reduces the huge search space to a rather small subset while still guarantee the quality of the discovered feature sets.

In 2011, Chongsheng Zhang has mainly worked on a data stream mining method, intending to extract frequent itemsets. This method has not been published yet and is described in Chapter 5 (page 79) of his thesis document [19].

5.2.2. Clustering on Multiple Dissimilarity Matrices

Participants: Yves Lechevallier, Francisco de A.T. de Carvalho, Thierry Despeyroux, Alessandra Silva Anyzewski.

In [23] we introduce hard clustering algorithms that are able to partitioning objects taking into account simultaneously their relational descriptions given by multiple dissimilarity matrices [49]. The aim is to obtain a collaborative role of the different dissimilarity matrices in order to obtain a final consensus partition. These matrices could have been generated using different sets of variables and a fixed dissimilarity function or using a fixed set of variables and different dissimilarity functions, or using different sets of variables and dissimilarity functions.

These methods, which are based on the dynamic hard clustering algorithm for relational data as well as on the dynamic clustering algorithm based on adaptive distances, are designed to furnish a partition and a prototype for each cluster as well as to learn a relevance weight for each dissimilarity matrix by optimizing an adequacy criterion that measures the fitting between clusters and their representatives.

These relevance weights change at each algorithm iteration and can either be the same for all clusters or different from one cluster to another. The usefulness of these partitioning hard clustering algorithms are shown on two time trajectory real world datasets.

5.2.3. *Clustering of Constrained Symbolic Data*

Participants: Marc Csernel, Francisco de A.T. de Carvalho.

In the context of our FACEPE collaboration with Brazil (cf. section 6.4.3.1), we have presented a method which allows clustering of symbolic descriptions constrained by presence rules in a polynomial time instead of a combinatorial one. This method allows to deal with "false missing values". Such a method can be applied on various classification problems [26].

5.2.4. *Web Page Clustering based on a Community Detection Algorithm*

Participants: Yves Lechevallier, Yacine Slimani.

Extracting knowledge from Web user's access data in Web Usage Mining (WUM) process is a challenging task that is continuing to gain importance as the size of the web and its user-base increase. That is why meaningful methods have been proposed in the literature in order to understand the behaviour of the user in the web and improve the access modes to information. In this work [42], we are interested in the analysis of the user browsing behavior. The objective is to understand the navigational practices of users (teachers, students and administrative staff). First we clean the data by removing irrelevant information and noise. During the second step, remaining data are arranged in a coherent way in order to identify user sessions. After we defined a new approach [42] of knowledge extraction. This approach treats the data resulting from the preprocessing phase (first and second steps) as being a set of communities. Our approach extends the Modularity measure, proposed by Newman and Girvan [97], in the Web Mining context in order to benefit from their classifying capacity in the communities discovery.

This work is done in collaboration with the LRIA laboratory – Université Ferhat Abbas, Sétif, Algérie

5.2.5. *Critical Edition of Sanskrit Texts*

Participants: Marc Csernel, Nicolas Béchet, Ehab Hassan, Yves Lechevallier.

New progresses concerning the computer assisted elaboration of Sanskrit texts have been made. First Nicolas Béchet and Marc Csernel have worked on the problem of moved texts. After an alignment between two versions of the texts, we discover that some parts of the text appears to have been moved according to the technics developed in [48]. Until now, we were not able to discover when a text has been moved in a manuscript.

Now using a words-grams technique proposed in [48], we were able to obtain quite good results on the moved texts problem and we were able to optimize the different possible parameters. A paper on the subject has been submitted to the Cicling 2012 conference (<http://www.cicling.org/2012/>).

After the new treatment related to the moved text problem, we need to provide an interactive display of the critical edition. During his internship, Ehab Hassan has been working on the subject and obtained good results. These results need to be deeply examined by Sanskritists to see if they always fulfill their needs.

5.3. Information and Social Networks Mining for Supporting Information Retrieval

5.3.1. *Clustering of Relational Data and Social Network Data*

Participants: Yves Lechevallier, Amine Louati.

The automatic detection of communities in a social network can provide this kind of graph aggregation. The objective of graph aggregations is to produce small and understandable summaries and can highlight communities in the network, which greatly facilitates the interpretation.

Social networks allow having a global view of the different actors and different interactions between them, thus facilitating the analysis and information retrieval.

In the enterprise context, a considerable amount of information is stored in relational databases. Therefore, relational database can be a rich source to extract social network. The extracted network has in general a huge size which makes its analyses and visualization difficult tasks. In [45], we propose a social network extraction approach from relational database.

Often, the network has a large size which makes its analysis and visualization difficult.

The aggregation step is a necessary task, so we offer [33] and [32] an aggregation step based on the k-SNAP algorithm [109] that produces a summary graph by grouping nodes based on attributes and relationships selected by the user.

This work is done in collaboration with Marie-Aude Afaure, head of the Business Intelligence Team, Ecole Centrale Paris, MAS Laboratory.

5.3.2. *Networks Solutions for Expert Finding and People Name Disambiguation*

Participants: Elena Smirnova, Yi-Ling Kuo, Brigitte Trousse.

The task of finding people who are experts on a given topic has recently attracted close attention. State-of-the-art expert finding algorithms uncover knowledge areas of candidate experts based on textual content of associated documents. While powerful, these models ignore social structure that might be available. Therefore, we develop a Bayesian hierarchical model for expert finding that accounts for both content and social relationships. The model assumes that social links are determined by expertise similarity between candidates. The results of EGC experiments on UvT expert collection have demonstrated the effectiveness of our algorithm [43].

E. Smirnova visited Intellius, people search technology company (Aug 8 - Oct 5, 2011): the goal of this visit was to validate the research on expert finding in social networks on real dataset and further advance it. As a real dataset, we have taken a sample of United States LinkedIn public profiles. We built an organizational network by connecting a LinkedIn user and his colleagues at different workplaces. We also constructed a geographical network from user's current location in the United States. We used Amazon's Mechanical Turk framework (<http://aws.amazon.com/code/923>) to collect user-oriented judgements for model evaluation. We found that the user-oriented model is statistically significantly preferred to the baseline model on 72,5% of queries.

Her work on name disambiguation done in 2010 has been integrated in an article related to the problem of quick detection of top-k Personalized PageRank (PPR) in [24]. The effectiveness of the chosen approach based on Monte Carlo methods for quick detection of top-k PPR lists has been demonstrated on the Web and Wikipedia graphs.

Yi-Ling Kuo during her internship has worked on Person Name Disambiguation and started by managing the analysis of the very huge Yahoo! Web graph.

This topic has been done in the context of Smirnova's thesis [18] which has been defended on december 15 (thesis supervised by B. Trousse (AxIS) and K. Avrachenkov (Maestro)).

5.3.3. *Towards an On-Line Analysis of Tweets Processing*

Participant: Nicolas Béchet.

Tweets exchanged over the Internet represent an important source of information, even if their characteristics make them difficult to analyze (a maximum of 140 characters, etc.). In [25], we define a data warehouse model to analyze large volumes of tweets by proposing measures relevant in the context of knowledge discovery. The use of data warehouses as a tool for the storage and analysis of textual documents is not new but current measures are not well-suited to the specificities of the manipulated data. We also propose a new way for

extracting the context of a concept in a hierarchy. Experiments carried out on real data underline the relevance of our proposal.

This work is done inside a collaboration with LIRMM and CEMAGREF.

5.4. Multidisciplinary Research For Supporting User Oriented Innovation

5.4.1. Usability Design and Evaluation Methods

Participants: Dominique Scapin, Yves Lechevallier, Pascal Marie-Dessoude, Claudia Detraux.

We pursued our work on articulation of usage mining approach and human factors expertise for the design and evaluation of information systems. Namely, collaborative clustering techniques were used to analyze data issued from users via a card sorting technique, with respect to an a priori ("expert") clustering. Considering the difficulties that people have in managing large information sets in their everyday life, for either professional or non-professional purposes (administration, social relationships, leisure, etc.), our recent research focusses on personal information space for which information bits are currently scattered many places.

In this PIMs field, there is little research with a user-centric approach, with the view that users-based knowledge might help specifying computer-based tools and a state-of-the-art [37] showed little work specifically on usability. Studies address a variety of questions from user needs to accessibility (including studies on older people) or user acceptance, among others. In the context of user-centered and long-term studies to understand the evolution of user information practice, we looked in a study at the intuitive way people organize their personal information, with or without computer systems, in order to help the design of future systems. Also, we recently surveyed 15 tools that claim to support personal information management.

5.4.2. Living Lab Landscape

Participants: Marc Pallot, Brigitte Trousse, Bernard Senach, Dominique Scapin.

In order to provide to the research community a comprehensive landscape of research streams in the Living Lab domain, we launched a study on the state-of-the-art about the ubiquitous notion of User Experience. During this continuous study, a landscape [34], [69] has progressively emerged that we organized through 4 main axes: focus granularity (individual/group), user's role in the design process (observed subject/value creator), collaboration style (structured/unstructured), and evaluation purpose (reliability/adoptability). Our landscape of research streams has been used by Finnish colleagues who conducted an empirical study on the use of the Living Lab research domain landscape as a tool for assessing the maturity level of 16 Finnish Living Labs [36]. The Living Lab research domain Landscape has allowed the study team to identify four categories of Living Labs.

5.4.3. Future Internet Domain Landscape

Participants: Marc Pallot, Brigitte Trousse, Bernard Senach.

There are many different Internet research areas and corresponding technologies that were already investigated, experimented and progressively deployed such as peer-to-peer, autonomous, cognitive and ad hoc networking, that have already demonstrated how to improve network performance and user experience. Peer-to-peer networking for large-scale distributed systems and widely used applications has proved both the feasibility and economic potential for delivering services to millions of users. Others emerged more recently in the context of the future Internet (FI), such as Cloud Computing for transparently sharing among users scalable elastic resources over a limitless network. As it remains difficult to visualise the conceptual evolution and articulate the various Internet research areas, we conducted a study for identifying the appropriate concepts that could populate the FI domain landscape [69], [71] over three different periods of time (1990-1999, 2000-2005 and 2006-2011). Several INRIA research teams are involved in FIRE (Future Internet Research Experimentation) Testbed projects, namely: PlanetLab, OneLab, TEFIS, SensLAB, and BonFIRE whose scientific leaders were interviewed during the development of the FI domain landscape. Four dimensions were used for landscaping the Future Internet research domain: evolution approaches (from incremental evolution design to Clean Slate re-design or radical evolution), Internet routing (from the basic data packet delivery

towards more sophisticated content distribution and retrieval capacities such as content Centric Networking), network type (from wired communication to wireless communication networks), evolution trend (from computer network towards network computing). The resulting tentative landscape of FI research areas shown in Figure 1 is intended to provide a faster and broader understanding of the different Internet research streams and related topics.

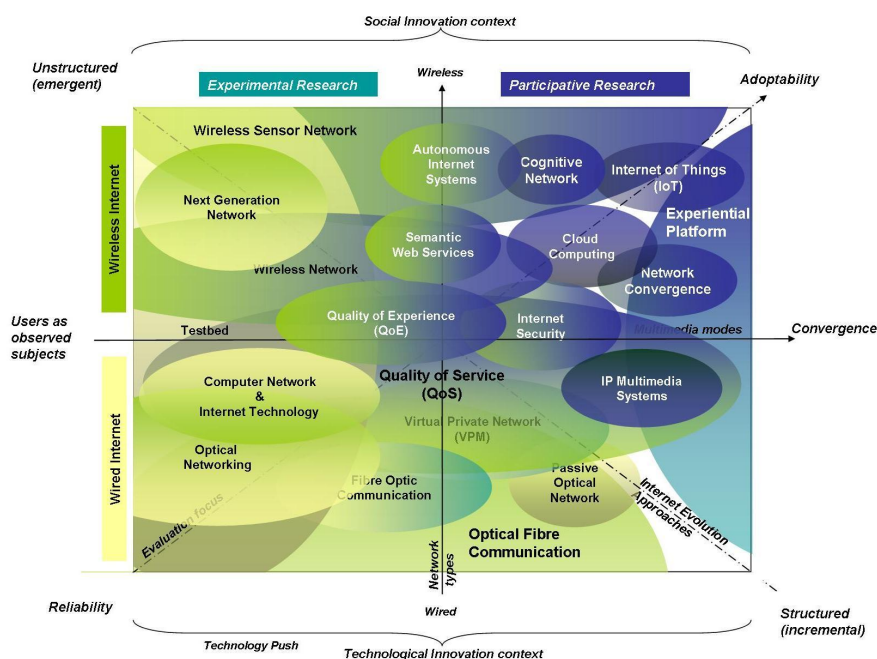


Figure 1. Future Internet Landscape

5.4.4. Future of Internet and User-open innovation for Smart Cities

Participants: Caroline Tiffon, Marc Pallot, Brigitte Trousse, Bernard Senach.

The goal of the Fireball project is to bring together three different constituencies: user driven open innovation, Future Internet, and Smart Cities [34], [39]. It aims at defining a roadmap [29], based on analysis of needs, opportunities and gaps, to benefit a wide scale implementation of the methodologies and concepts elaborated. A first objective in the project was to get a clear picture of the state-of-the-art in each domain. During the review, progressively emerges a landscape [69] that we organized along 4 main axes: wiring (wired/wireless), user's role (subject/actor), Internet evolution approach (structured/unstructured), evaluation purpose (reliability/adoptability). A large variety of FI research have been engaged. If initial efforts in Future Internet research have been directed towards the goal of providing the technical infrastructure supporting the next network generation, a rising trend in this research field is to consider now a higher level layer, the layer of services.

5.4.5. Method and Tool for Selection of Open Innovation Software Tools

Participants: Mylène Leitzelman, Brigitte Trousse.

In spite of an important number of tools supporting open innovation, there is few comparative evaluation and no grid or evaluation criteria helping to choose a product. A 2011 review in the Computer Aided Innovation field ⁶ provides a large overview of available tools in relation with a wide range of innovation cycle features.

This useful top-down categorization approach is of little help to choose a specific tool. To find the best OI tool supporting idea exchanges among a community of participants, we built an exploratory method on the Web and we elaborate an assessment grid of OI tools based on the QSOS method which is a method designed to qualify, select and compare free and open source software in an objective, traceable and argued way. It publicly available under the terms of the GNU Free Documentation License. In our QSOS method, evaluation criteria are organized in a tree-hierarchy grid with, a scoring method procedure of each tree-leaf criteria (from 0 - not covered to 2 - completely covered). To achieve the construction of the OI tools criteria assessment grid (first step), we used different mining tools for Web crawling, network analysis, criteria classification and from the 29 top rated OI tools, we finally selected 6 of them from which we extracted the tree-map categorization used to build the reference software criteria sheet. In the following steps, after appropriate weighting, we used the provided OS3 Web application and we were able to compare 4 top selected OI tools [31].

To support our method, we developed a QSOS-based OI Grid for supporting the OI tool selection. The QSOS Grid to compare OI tools, which is in an XML format, has been translated into a MindMap. As a first mock-up, the QSOS Web Interface O3S will be installed at the beginning of 2012 on our server. For the future, we will extend our own QSOS comparative method to other softwares and to other categories interesting for the Living Lab community.

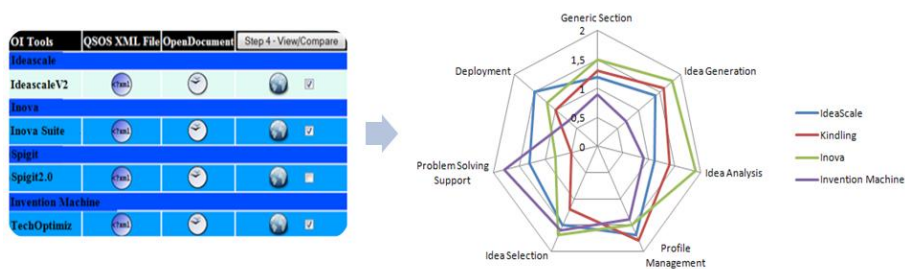


Figure 2. Radar Positioning of Selected Open Innovation Tools

5.4.6. Extension of Methods for Idea Generation Process

Participants: Anne-Laure Negri, Caroline Tiffon, Bernard Senach, Brigitte Trousse.

Internet of Things (IoT) is supposed to be a physical world where everyday objects, rooms and machines are connected to one another and to the larger digital world. In this web of people and objects, individuals as well as things will have their own unique URL and, according to interactions between all these entities, social networks will be articulated with a ring of connected objects. This mash up of "hyper groups" and "hyper objects" will be the next step towards a deeper level of automation in which the user interface has vanished, the explicit control over the world is no longer the rule and where the users will have to understand the dynamic changes of their environment in relation to their social interactions and to their physical behaviour. The design of IoT based services therefore raises many challenges related to the user experience and requires a deep understanding of users' needs in their real life environment as well as many field experiments; this is why the Living Lab approach appears as the qualification device which has been lacking so far. As described in a paper accepted for ServDes2012 conference (February 2012) among 80 papers submitted, we developed and tested two methods designed for Internet of Things service idea generation: GenIOT (Generative Technique for the Internet of Things) and Aloha! (Animation Lens: Object/Human Actoring!) methods.

⁶Hüsig, University Regensburg & Khon, Otto Beisheim School of Management

- The **GenIOT** method aims at providing citizen a tool for identifying and sharing examples of situations where they may benefit from an Internet of Things based service. Indeed the objective is to help the introspective effort of analysing one' own daily behavior and unveil situated data in order to develop grounded internet of things services ideation. Fake sensors are placed by the participants in their daily environnement and pictures of the sensors in situ are shared and tagged on a collaborative platform. Other participants are invited to discuss on line the ideas behind the pictures. Gamification rules are implemented in the platform in order to enhance collaboration and participation.
- The **Aloha!** method tackles another creative dimension as it asks participants to role or play characters or objects and bodystorm a collaborative scenario meeting the characters need. Participants report it to be a fun and effective method, alternative to traditional brainstorming and integrating serendipity as a creative asset.

For the exploration step in the context of ELLIOT, we developed NiceAir, an android mock-up for visualizing air quality data on Google map in Nice as well as some interest points (free bikes, free park places, bus stop, etc.). Such a mock-up will be available in the co-creation step of green services in the ELLIOT project and during the european Mobility Week.

5.4.7. Mock-ups for two innovation processes (exploration step)

Participants: Lucile Gramusset, Guillaume Pilot, Mohamed Gaieb, Bernard Senach, Brigitte Trousse.

In the context of two contracts (TICTAC and ELLIOT) related to user oriented innovation process, we have developped two mock-ups

- Based on the user feedback from the first experiment in TIC TAC (Cf. section 6.1.1, we decided to develop a mock-up *MobilTIC* of a real-time information service related to public transportation (Envibus & SNCF) useable for any smartphone with internet access for Sophia-Antipolis workers. We designed a Web interface the most simple based on PHP/MySQL technologies and accessible from a computer or 3G mobile phone. Usage analysis of MobilTIC has been anticipated by providing rich logs. An exploration task with citizen is planned in January 2012 with a new experiment with an improved version.
- A first mock-up called *Nice Air* has been developped in the context of ELLIOT (Cf. section 6.3.1.1 by L. Gramusset and M. Gaieb on android smartphone for providing information related to air quality and noise on a map of the area of Nice Cote d'Azur with some interest points such as bus stops and Vélib parkings.

5.5. FocusLab Experimental Platform and Software

5.5.1. ATWUEDA based Clustering Approach for System Monitoring

Participant: Yves Lechevallier.

Progressive advances in hardware and software technologies have enabled the production and storage of system monitoring data streams in a wide range of fields (e.g. telecommunications, sensor networks, etc.). Traditional clustering methods are unable to deal with data of such a voluminous and dynamic nature. In this work [51], we propose an efficient clustering approach (ATWUEDA) for monitoring massive time-changing data streams. This work considers a real case study on condition monitoring data streams of an electric power plant provided by EDF.

This work is done in collaboration with Alzenny Da Silva of BILab laboratory (Telecom ParisTech and EDF R&D Common Laboratory)

5.5.2. FocusLab Experimental Platform (CPER Telius 2008-2012)

Participants: Xavier Augros, Mohamed Gaieb, Brigitte Trousse, Yves Lechevallier.

The FocusLab platform aims to be a major delivery mechanism of previous and current work in AxIS. It is a way to make methodological contributions (including software) available for the scientific community, but also a way for stimulating further research. This work has slowly started on the software part due to the absence of human resource funding and due to the absence of engineers in the team until 2010. Mid 2011, we started the specification and the development of a first version of a platform with three parts (hardware, software and methods) with the arrival of two engineers on the ELLIOT and TIC TAC contracts. A first version is available since the end of september as a Web portal and a second one is planned for the end of 2012 with advanced features for the software part (cf. service oriented platform, SOA architecture and interoperability).

Related to the software part we are in the process of developing several AxIS methods as Web services: we started with SCDS (cf. 4.2.3) which was demonstrated in the context of the MIDAS project on two applications (Orange labs mobile portal and vehicle trajectories) and in the ELLIOT platform (linked to the San rafaelle Hospital media use case) at the first review meeting (cf. 6.3.1.1) applied on data issued from San Rafaelle Hospital use case. ATWUEDA (cf. 4.3.2), GEAR (Marascu's thesis) are under development as web services.

Our work on mining evolutive data (ATWUEDA) and data streams (such as SCDS) have been used in real applications in the context of Internet of things and sensors: ATWUEDA (system monitoring for EDF (cf. section 5.5.1) and SDMS (cf. section 4.2.3).

6. Partnerships and Cooperations

6.1. Regional Initiatives

6.1.1. ADEME TIC TAC (2010 - 2012)

Participants: Anne-Laure Negri, Caroline Tiffon, Bernard Senach, Brigitte Trousse.

Title: TIC TAC

Type: PREDIT groupe 3, Mobilité dans les régions urbaines

Challenge: *Technologies de l'Information et de la Communication – Transports Assemblés Co-hérents*

Instrument: Mobilité dans les régions urbaines

Duration: 2010 - March 2012

Coordinator: VuLOG

Others partners: MHC Conseil, CETE Méditerranée, CASA

See also: Technologies <http://www.projettictac.org/>

Abstract: TICTAC project aims to provide an advanced travellers' information system in which real time information about waiting time at bus stop will be provided: users define their "favourite" and can call a vocal server which give them immediately the requested information.

This year we first participated in a study of current trends in urban mobility Real-time MultiModal Information Systems (RTMMIS) conducted by CETE méditerranée [28]. After identifying the usage scenario [75], [74] and participating in the specification of the prototype [76], we specified the experiment of the first prototype developed by VuLOG in [77] and reported results of our usage analysis in a deliverable [78]. See also 7.1.1.

6.1.2. PACALABS HOTEL-REF-PACA (2010 - 2012)

Participants: Florian Bonacina, Bernard Senach, Brigitte Trousse, Yves Lechevallier, Nicolas Béchet, Ehab Hassan.

Title: HOTEL-REF-PACA

Type: Pacalabs

Challenge: Referencing of Web Sites for accomadation in Paca

Instrument: Pacalabs (Paca Region and FEDEPacalabsR fundings)

Duration: October 2010 - May 2012

Coordinator: Full Performance

Others partners : General Council of Maritim Alps

This project is conducted with Full Performance, a SME specialized in Web site referencing. It aims at improving hinterland tourism, hotel-keepers and tourists are involved in the experimentation. Experiments of different new referencing rules are conducted with Web site visitors in order to study their effect on behavioral changes and on touristic choices. The experimentation consists in three stages: current referencing rules are first studied and their efficiency estimated through eye-tracking experiments. Then new rules are explored and tested with users. When the convenient new rules are selected, their efficiency is evaluated through data mining analysis and qualitative studies.

This year we evaluated the ergonomics of 19 Web sites of hotels associated to our project and we formulated several recommendations according types of Web sites [72], [73]. We then formalised the know-how of the SME in referencing Web sites. Due to some delay in the experiment (mainly tag installation, data access), our data analysis task has been postponed to May 2012.

6.1.3. PACALABS ECOFFICES (2010 - 2011)

Participants: Guillaume Pilot, Yves Lechevallier, Bernard Senach, Brigitte Trousse.

Title: ECOFFICES

Type: Pacalabs

Challenge: Energy Challenge within Offices

Instrument: Pacalabs (Paca Region and FEDER fundings)

Duration: august 2010 - november 2011

Coordinator: Osmose

Others partners: CASA, CSTB

See also: <http://www.ecoffices.com/>

Abstract: ECOFFICES is an eco-challenge within an enterprise: offices are equipped with sensors and actuators. Actions of employees on actuators are registered and consumption behaviors are tracked. The experimentation consists in three successive stages: data are first recorded during the usual work of the challengers, then feed-back is provided through user interface and in the challenge phase, 3 teams are competing to reach the best economy level. After the challenge, data are registered to study the change of practices, if any. The goal of the project is to provoke behavioral changes and our team is in charge of the evaluation.

This year we have elaborateDSd the first experimentation protocol [59] for the original concept of **eco-challenge** within an enterprise. Due to some delay in the challenge (which ended september 30), the end of our contract has been delayed until novemberb-o 2011 in order to have enough time for data analysis [80], [61], [62]. We also co-organized three open days at CSTB and have an active dissemination activity [79] in two european conferences [27], [68] and the World Usability Day [60].

6.1.4. CPER Telius (2007 - 2013) and ICT Usage lab

This grant, funded by regional and European support, covers our experimental platform supporting usage data gathering and analysis of individual and collective usage of information systems. Such an experimental platform called Focus was renamed FocusLab (to avoid the ambiguity with a new Inria team) (cf. section 5.5.2). FocusLab is an experimental platform proposed for supporting collecting and analysing individual or collective usage data. This platform will be part of the infrastructure of the living lab ICT Usage Lab. This year ICT Usage lab was again member of EnOLL, the european network of living labs (composed of 274 living labs after 5th wave).

6.2. National Initiatives

6.2.1. ANR MIDAS (2008 - 2011)

Participants: Brigitte Trousse [correspondant], Chongsheng Zhang, Mohamed Gaieb.

Title: MIDAS

Type: ANR

Challenge: Summarizing and Analysing Data Streams

Instrument: MDCO

Duration: 2008 - 2011

Coordinator: Telecom Paris Tech

Others partners: Ceregmia, EDF, France Telecom R&D, LIRMM, Telecom ParisTech

Abstract: The MIDAS project aims at studying, developing and demonstrating new methods for summarizing data streams. It tackles the following scientific challenges related to the construction of summaries.

Our source code has been integrated in the MIDAS demonstrator based on Esper, a component for complex event processing and Postgres as well as our two applications [66], [67], [57]. Two videos have been prepared by B. Trousse for ANR STIC conference (January 2012).

In 2011, we demonstrated the use of the SCDS MIDAS approach [11] to summarize data streams on two applications for the ANR STIC conference (Lyon, december):

- Vehicle trajectories (Brinkhoff generator <http://iapg.jade-hs.de/personen/brinkhoff/generator/> in the context of MIDAS project (Java version)
- Orange mobile portal logs (100 million records, 3 months) in the context of Midas project (Java version) and the CRE (Orange C++ version)

C. Zhang's thesis has been partially funded By MIDAS [19] (cf. section 5.2).

6.2.2. Web 2.0 SCAR (2009 - 2011)

Participants: Florian Bonacina, Anne-Laure Negri, Bernard Senach, Brigitte Trousse.

Title: SCAR

Type: Web 2.0

Challenge: Collaborative and Adaptative Recommender system

Instrument: Web based Innovative Service

Duration: 2009 - 2011

Coordinator: Wozaik

Others partners : INRIA

Abstract: The goal of the Scar project is to provide to users of an advanced bookmarking system such as a recommender based on social

A state-of-the-art of tools related to the management task of bookmarks with a cognitive approach have been done.

6.2.3. *Process 2.0 (2009 - 2011)*

Participants: Pascal Marie-Dessoude, Dominique Scapin [correspondant].

Title: Process 2.0

Type: DGCSI

Challenge: Citizen-oriented e-Gov Tool

Instrument: Innovative Web

Duration: 2009 - 2011

Coordinator: Genigraph

Others partners: LIESP (via INSAVALOR), Petals link (ex EBM Websourcing), Région Midi-Pyrénées

Abstract: Process 2.0 Project proposes to consider the collaborative process as a composition of business services, "drawn" by end users through a collaborative design studio process that supports a multi-faceted modeling and integration of patterns.

This year, a set of specifications for collaborative work was produced [63], and the project ended with the ergonomic evaluation of the e-Citiz tool [64].

6.2.4. *ANR MyCitizSpace(2007 - 2011)*

Participants: Pascal Marie-Dessoude, Dominique Scapin [correspondant].

Title: MyCitizSpace

Type: ANR

Challenge: e-gov tool and personal information

Instrument: RNTL

Duration: 2007 - 2011

Coordinator: Genigraph

Others partners: LIG (HCI team) Grenoble, IRIT Toulouse, Genigraph, Almetis, DRTEFP d'Ile de France, Région Midi-Pyrénées

See also: <http://genibears.com/cgi-bin/twiki/view/MyCitizSpace/PresentationDuProjet>

Abstract: "Méthode et outils de conception basés sur une approche d'Ingenierie Dirigée par les Modèles (IDM) pour l'exécution distribuée des téléprocédures plastiques à espace de données personnelles sécurisé " aims at the design of a method and tools based on a Model-Driven Architecture for the distributed execution of plastic teleprocedures incorporating a secure personal data space, making the electronic procedures between the administrations and the citizen the most seamless possible.

This year, the project ended with the ergonomic evaluation of the e-Citiz tool [65].

6.2.5. *ANR PIMI (2010 - 2013)*

Participants: Claudia Detraux, Dominique Scapin [correspondant].

Title: PIMI

Type: ANR

Challenge: Personal Information Space

Instrument: Verso 2010

Duration: 2010 - 2013

Coordinator: Genigraph

Others partners: LRI, IRIT, Institut Telecom, Montimage, The Grand Duchy of Luxembourg

Abstract: PIMI Project aims at the definition of a design environment and a deployment platform for Personal Information Management system (PIM). The future PIM must provide the end-user personal data access with services that are relevant to his needs. In order to take mobility into account, the PIM will be accessed both by mobile devices (smartphone) and personal computers.

The main contribution this year is described in section 5.7.

This work also led to a PIMI project deliverable [70], in collaboration with LRI (P. Poizat). The research was pursued with another study [58] that produced ergonomic requirements for the PIMI prototype. An experiment with a mock-up simulating forms with their information content and providing the ability to change the structure and naming of items has been made. The observations concerned the users during the task of data entry and retrieval of data, and changes in the PIMI mockup. Also, the users acceptance to share their information or not has been recorded. The results led to a ranked list of recommendations on aspects including: structure and organization of content, items naming, information sharing, removal of sections and categories, redundancies.

6.2.6. Other Activities

6.2.6.1. Health

AxIS contributed to the CGIET report [100]:

- M. Pallot as member of the CGIET ⁷ Working Group on “Les Living Labs en santé et autonomie: concepts, enjeux, pratiques”, coordinated by R. Picard, CGIET, Référent Santé.
- B. Trousse as Inria researcher and co-animator of the ICT Usage lab

M. Pallot participated to the “Séminaire Living Lab pour la santé et l’autonomie”, organised by CGIET, Paris, 25 January 2011 and to the “Colloque TIC Santé 2011”, Paris, 9 Février 2011, Association FORMATIC Santé, Session “Le développement de Living Labs ou expérimentation des TIC par des communautés d’acteurs sociaux - Intérêt et limites dans le domaine sanitaire et médico-social”. This year we have several contacts between ICT Usage Lab (B. Trousse), Autonom’Lab (Limousin) and CNR santé (P. Mallea) in order to identify topics of future collaborations.

6.2.6.2. Collaborations linked to our Contracts

- FIREBALL and Future Internet Landscape: Interviews conducted with the main Inria scientific leaders of FIRE projects [69].
- ELLIOT and INRIA i-lab (CLIME EPI, Numtech SME): we have done a qualitative Data Analysis of 80 questionnaires related to the *Air Expert application* demonstrated in Futur en Seine (June 17-26) by CLIME EPI.
- ELLIOT and ATMOPACA related to their website and its improvement.
- MIDAS (Telecom Paris Tech and EDF R&D): we collaborated with Georges Hébrail (Telecom/EDF) via the MIDAS project and the BiLab laboratory with A. da Silva [51].

Academic Collaborations

- Université de Bretagne Occidentale : M. Csernel collaborated with M. LePouliquen [30].
- Ecole Centrale de Paris: Y. Lechevallier collaborated via STIC France-Tunisia with M-A. Aufaure in the context of graph mining and Social Network [45], [33], [32] and of e-tourism[48].
- LIRMM: S. Bringay, M. Roche P. Poncelet [25]
- IRIT (Toulouse) : D. Scapin and C. Detraux collaborated with M. Winckler [70].
- LRI (Orsay): D. Scapin collaborated with P. Poizat [70].
- University of Nice Sophia Antipolis: Professor J-P Zirotti (Socioly, LASMIC laboratory) related to the “Master Urban Studies” and F. Debos (I3M laboratory) related to a new Pacalabs Ecofamilies (2012).

⁷(Conseil Général de l’Industrie, de l’Energie et des Techniques)

6.3. European Initiatives

6.3.1. FP7 Projects

6.3.1.1. STREP ELLIOT (2010 - 2013)

Participants: Anne-Laure Negri, Mylène Leitzelman, Bernard Senach, Caroline Tiffon, Brigitte Trousse [correspondant].

Title: ELLIOT

Type: COOPERATION (ICT)

Challenge: Experiential Living lab Platform for the Internet of Things

Instrument: Specific Targeted Research Project (STREP)

Duration: September 2010 - February 2013

Coordinator: TXT Polylemia (Italy)

Others partners: University of Nottingham, University of Readings, BIBA, Hospital San Rafael, CENG, Fing, Vulog

See also: <http://www.elliott-project.eu/>

Abstract: The ELLIOT project (Experiential Living Labs for the Internet of Things) aims at developing an Internet Of Things (IOT) experiential platform where users/citizen are directly involved in co-creating, exploring and experimenting new ideas, concepts and technological artifacts related to IOT applications and services. Based on a three levels experiential model issued from previous European projects, the study will capitalize on existing practices of co-creation in IoT contexts. It will allow the exploration of the potential impact of IOT and of the Future Internet in the context of the Open User Centered Innovation paradigm followed in the Living Lab approach.

This year we mainly specified our Green Service use case [55] and the first prototype of the ELLIOT platform [53], [54]: This platform calls for the purposes of the data analysis component our FocusLab server: for the prototype we have implemented three methods as web services: SCDS for summarizing data streams as a approximative sequential pattern, GEAR for computing the tendency of several data streams [11] and a specific one for the Hospital san rafaelle use case. As specified in ELLIOT D4.2.1 [56], five co-conception workshops (2 groups) were held in order to identify the ideas and positions of citizen and stakeholders interested in mobility and air quality & noise level with regards to internet of things and potential services.

- 2 co-conception workshops in collaboration with the Regional Internet Space (ERIC in French) called Le Hublot in Nice: November 28 and December 12
- 3 co-conception workshops in Sophia Antipolis with citizen and stakeholders interested in Air quality and Mobility: November 25, December 7 and 19 As part of ELLIOT exploration step, we performed a heuristic evaluation of the atmopaca.fr website. Recommendations were reported to Atmopaca and site modified accordingly.

During these workshops participants were as well asked to explore an Android mock-up visualizing air quality, pollen level, bus station, free “vélo bleu” bicycle and noise level. A mock-up called Nice Air (V1) was developed by L. Gramusset during her internship for supporting the innovation process (cf. section 5.4.7)..

6.3.1.2. CSA FIREBALL (2010 - 2012)

Participants: Marc Pallot, Brigitte Trousse [correspondant], Caroline Tiffon, Bernard Senach.

Title: FIREBALL ⁸

Type: CAPACITIES (ICT)

Challenge: Future Internet Research and Experiments by adopting Living Labs Towards Smart Cities

⁸FIREBALL: Future Internet Experimental Facility and Experimentally-driven Research

Instrument: Coordination and Support Action (CSA)

Duration: May 2010 - April 2012

Coordinator: Luleå University of Technology (Sweden)

Others partners: AALTO (Finland), AENESCEN (Italy), MCC (United Kingdom), SAIM (Netherlands), ESADE (Spain), ALFAMICRO (Portugal), ISA (Portugal), E-NOVA (Portugal) HK (Finland), INRIA (France), DIMES (Finland), IBBT (Belgium), AUTH (Greece), OY (Finland), IMAGES & RESEAUX (France), BCN (Spain)

See also: <http://www.fireball4smartcities.eu/>

Abstract: FIREBALL (Future Internet Research and Experimentation By Adopting Living Labs - towards Smart Cities) is a coordination action which establishes a coordination mechanism through which a network of Smart Cities across Europe engages in long term collaboration for adopting User Driven Open Innovation to explore the opportunities of the Future Internet.

We mainly have collaborations with Prof. Dr Nicos Komninos (Faculty of Engineering, Aristotle University of Thessalonik, Greece) and Hans Schaffers (Expert at ESoCE Net, Director of Adventure research, Netherlands) related to several scientific publications [34], [39], [29], [41] and also the deliverable [71]. See sections 5.4.3 and 5.4.4.

6.3.1.3. IDEAS (2010 - 2012)

Participants: Nicolas Béchet, Marc Csernel [correspondant].

Title: IDEAS

Type: CAPACITIES (SSH)

Instrument: Coordination and Support Action (CSA)

Duration: January 2010 - June 2012

Coordinator: Ecole française d'Extrême Orient (France)

Others partners: University of Turku Institute of Ethnology, Hungarian Academy of Sciences, British Academy, Asien-Afrika-Institut of the University of Hamburg, Istituto italiano per l'Africa e l'Oriente

See also: <http://www.ideasconsortium.eu/>

Abstract: IDEAS is the acronym of "Integrating & developing European Asian studies". It joins the efforts of five institutions devoted to the field of Asian studies and INRIA to help them on the I.T point of view. The overall objective of IDEAS is to make progress in coordinating and bringing together academic research, researchers and policy-makers. IDEAS will make use of the expertise and resources of a recently created network, the European Consortium for Asian Field Study (ECAAF), which comprises 44 research institutions from ten EU countries and nine Asian countries and Russia, which specialize in Asian studies, and a network of 22 field research centers run by ECAAF members across Asia.

Inria is leader of the Work Package 3 which will facilitate the access of scholars and others involved with Asian Studies to the ECAAF network's knowledge resources and develop multidisciplinary web-based research tools. WP3 initially focuses on a sample base comprising manuscripts in Tibetan and Sanskrit kept in the Giuseppe Tucci collection at IsIAO⁹ in Roma. INRIA, focusing on information retrieval and data management, has developed a prototype of a website dedicated to the consultation ancient Asian. We have proposed a new search engine based on clustering techniques which provides always a "reasonable" number of answers whatever the question, allowing by successive ameliorations to obtain the most suitable answers, even without knowing the right question. This prototype has been constructed by N. Béchet and demonstrated on a set of pictures (such as stupas...) displayed on the current IsIAO website showing quite well the profit that one can expect from such a search engine.

⁹IsIAO: Istituto italiano per l'Africa e l'Oriente

6.3.2. Collaborations in European Programs, except FP7

6.3.2.1. TwinTide

Participant: Dominique Scapin [correspondant].

Program: COST IC0904

Project acronym: TwinTide

Project title: Towards the Integration of Transectorial IT Design and Evaluation

Duration: 2010 - 2013

Coordinator: Effie Lai-Chong Law - Swiss Federal Institute of Technology (ETH Zürich), Switzerland (CH) / University of Leicester, UK

Other partners: see <http://www.irit.fr/recherches/ICS/projects/twintide>

Abstract: Towards the Integration of Transectorial IT Design and Evaluation is a usability and user experience research community running under the auspices of COST (<http://www.cost.esf.org/>). The main objective is to harmonize research and practice on design and evaluation methodologies for computing artifacts, across sectors and disciplines, bringing together researchers and D&E professionals.

6.3.3. Contribution to the Preparation of the Next Framework Programme (FP8 – Horizon 2020)

Participants: Marc Pallot, Brigitte Trousse.

M. Pallot participated to the FIA Roadmap workshop in Brussels, 31 March 2011, as member of the FISA (Future Internet Support Actions) roadmapping working group on FIA Roadmap [40] and contributed to the FISA Roadmap presented in May 2011 at FIA Budapest. AxIS participated to a “Smart Cities and FIRE” workshop at FIA Budapest in May 2011 and contributed to the linkage among Living Labs community, Smart Cities network and Future Internet Assembly [39], as well as relevant projects such as FIRESTATION, SmartSantander, TEFIS, ELLIOT, Apollon and many others.

6.4. International Initiatives

6.4.1. Participation to Standards in Ergonomics

Participant: Dominique Scapin [correspondant].

Standardization in ergonomics is increasingly important due to the application of the European directives about the introduction of measures to encourage improvements in the safety and health of workers (e.g., 2006/42CE on security of machinery); as well as taking into consideration national and international legislation, including accessibility. Standardization in ergonomics covers many issues. The contributions from INRIA (D. L. Scapin) concern mainly software ergonomics, in the context of AFNOR X35A, X35E, as well as ISO and CEN mirror groups:

- National: AFNOR X35A (Ergonomie des Logiciels Interactifs) (expert); AFNOR X35E (Ergonomie des Logiciels Interactifs) (chair).
- European: CEN/TC 122/WG 5 (Software ergonomics and human-computer dialogs) (expert)
- International: ISO/TC 159/SC4/WG5 (Software ergonomics and human-computer dialogues) (expert) ISO/TC 159/SC4/WG6 (Human-centred design processes for interactive systems) (expert and co-editor of ISO 9241-230); JWG ISO/TC 159/SC 4 and ISO/IEC JTC1 SC 7 (System and software product Quality Requirements and Evaluation (SQuARE) - Common industry Format) (expert); ISO/TC 159/SC1/WG1 (Ergonomic principles) (expert).

6.4.2. Visits of International Scientists

6.4.2.1. Internships

Alessandra Silva Anyzewski (from Apr 2011 until Oct 2011)

Subject: Proposition et implémentation d'un algorithme d'extraction de patrons de requêtes à partir d'un graphe.

Institution: Instituto Tecnológico de Aeronáutica - Divisão de Cooperação - Pró-Reitoria de Extensão e Cooperação (Brazil)

Yi-Ling Kuo Yi-Ling

Subject: Web Graph Clustering for Person Name Disambiguation Problem

Institution: National Central University (Taiwan)

Rong Guan (from April 2011 until July 2011)

Subject: Multivariate analysis of interval-valued data

Institution: Beihang University, Beijing, (China)

Amine Louati (from March 2011 until September 2011)

Subject: Social Network Aggregation

Institution: ENSI, Tunis, Tunisia

Ehab Hassan (from April 2011 until September 2011)

Subject: Distances d'édition pour les textes Sanskrits

Université de Dauphine, France

Yacine Slimani (October 2011)

Subject: A community detection algorithm for Web Usage Mining Systems

LRIA, Université Ferhat Abbas, Sétif, Algérie

6.4.3. Participation In International Programs

6.4.3.1. FACEPE, Brazil 2003-2013

Participants: Yves Lechevallier, Marc Csernel.

We pursue our collaboration on clustering and Web usage mining and start a collaboration on social network data analysis with Carvalho from,

We pursue our collaboration with F.A.T. De Carvalho, Professor at Federal University of Pernambuco (Recife) and his team. inside the scientific project **Clustering of Relational Data and Social Network Data Analysis** accepted by FACEPE and INRIA (01/2010-12/2011).

Researchers and students are concerned by this project from AxIS and CIn-UFPE side, which aims at developing methods of clustering of relational data and social network data analysis tools:

- This project aims to develop new clustering methods and algorithms for usual or complex feature data as well as for relational data. These new methods [23] (cf. section 5.2.2) will apply simultaneously on several feature or relational data tables and they must be able to learn a relevance weight for each data table in each cluster.
- M. Csernel has presented a new approach in Constrained Symbolic Data Analysis [26] (cf. section 5.2.3). M. Csernel has visited the UFPE during November and two topics on divisive clustering and the introduction of histogram variables in Norm Symbolic Form for clustering purpose were discussed.

A scientific project "Combining Methods for the Classification of Multi-valued and Interval Data" (CM2ID) submitted by F. De Carvalho and A. Napoli has been accepted by FACEPE and INRIA. The project starts on January 2012 and ends on December 2013. This project concerns two EPIs AxIS and Orpailleur.

6.4.3.2. STIC, Tunisia 2008-2011

Participant: Yves Lechevallier.

During the STIC program, in collaboration with M.-A. Aufaure (Ecole Centrale), Y. Lechevallier supervised 4 masters and 2 PhD thesis (Riadi Lab, ENSI Tunis) in this project. These masters and PhD thesis subjects are about Web mining (usage, content and structure, using different methods) and ontology construction from heterogeneous sources. Y. Lechevallier is involved in a new STIC program *Exploration des réseaux sociaux pour les systèmes de recommandation* between France-Tunisia.

In this STIC project, we welcomed from ENSI (Tunisia) at Rocquencourt A. Louati (April-August). A. Louati participated actively to the themes of our STIC with the co-supervision of H. Baazaoui Zghal, M.-A. Aufaure, H. Ben Ghezala and Y. Lechevallier. In [33] and [32] we describe the need to design and implement a tool for analysing social networks based on the aggregation graphs. After a state-of-the-art of social networks and their analysis, a tool graph based aggregation *k-SNAP approach* was tested and applied on ADEME data by M-A Aufaure from Ecole Centrale. See section 5.3.1.

7. Dissemination

7.1. Animation of the Scientific Community

7.1.1. General Audience

- Two accepted manifestations (AxIS INRIA & ICT Usage lab) at the **Mobility Week event European** in Nice and Antibes territories in relation to ELLIOT (cf. section 6.3.1.1) and TIC TAC (cf. section 6.1.1) projects: Demonstration of the Nice Air application and street survey on people relation to air pollution (cf. 6.3.1.1) and demonstration of MobilTIC application and questionnaires on citizen needs in terms of a real-time information system for public transportation (cf. 6.1.1). <http://www.agissons.developpement-durable.gouv.fr/-Semaine-europeenne-de-la-mobilite->
- Co-organization of **three open days** at CSTB (Sophia Antipolis) related to the PACALABS Eco-fices project and their reports [79] (cf. 6.1.3).

7.1.2. Editorial Boards and Reviewing

AxIS members participate in the editorial boards of the following journals:

- MODULAD (electronic journal), <http://www.modulad.fr/>: Y. Lechevallier as co-editor
- BIT (Behaviour & Information Technology): D.L. Scapin (Associate Editor)
- Journal of Symbolic Data Analysis: Y. Lechevallier and B. Trousse
- IJDST - International Journal of Design Sciences & Technology): B. Trousse
- Co-Design Journal: B. Trousse
- IE - International Journal of Innovation and Entrepreneurship: M. Pallot
- UAIS -International Journal of Universal Access in the Information Society (Transactions): D.L. Scapin
- IJHCS - International Journal of Human-Computer Studies: D.L. Scapin
- IWC - Interacting with Computers: D.L. Scapin
- IJPOP - International Journal of People-Oriented Programming: D.L. Scapin
- JIPS - Journal d'Interaction Personne-Système: D.L. Scapin

AxIS members are very regularly reviewers for various major journals: let us note for 2011 TKDE, BIT, IJHCS (International Journal of Human-Computer Studies), JMUI (Journal of Multimodal User Interfaces), Le Travail Humain, UAIS, IwC;

D. Scapin was reviewer for a book: *Cognitively Informed Interfaces* to be published by IGI Global (<http://www.igi-global.com/>)

7.1.3. Conferences/Workshops Scientific Program Committees

- Y. Lechevallier is **scientific chair** of the 12th French-Speaking International Conference EGC 2012 which is the main francophon-speaking conference in KDD (around 400 participants) (<http://egc2012.labri.fr/>).
- B. Trousse is member of the **supervising committee** of the association EGC (<http://www.egc.asso.fr/>).

AxIS permanent members are involved in the following program committees of conferences and workshops:

- EGC 2011, Extraction and Management of Knowledge, january, : Y. Lechevallier, B. Trousse
- IC 2011, 22èmes journées francophones d’Ingénierie des connaissances, 16-20 may, Chamberry: B. Trousse
- CSCWD 2011, the 15th International Conference on Computer Supported Cooperative Work in Design, June 8-10, lausanne, Switerland (IEEE SMC Society): B. Trousse
- WOTIC 2011, International Workshop on Information Technology and communication, 1-15 october, Casablanca (Morocco): B. Trousse
- H2PTM 2011, Hypermédias et pratiques numériques, 12-14 October, Metz: B. TrousseN
- EGC Maghreb 2011, Extraction and Management of Knowledge, November (Tanger, Morocco): B. Trousse
- EGC 2011, EvalECD workshop, january: Y. Lechevallier
- ACHI 2011’s, The Fourth International Conference on Advances in Computer-Human, February 23-28, - Gosier, Guadeloupe, , under DigitalWorld 2011 umbrella: D. Scapin
- SETIT 2011, Sixth International Conference Sciences of Electronic, Technologies of Information and Telecommunications, Sousse, Tunisia, March 23-26, 2011: D. Scapin
- IHM 2011 (Interaction Homme-Machine), October 24-27 2011, Nice - Sophia Antipolis: D. Scapin
- Workshop UED 2011, Workshop on Usability in Education at IHM’11, Nice - Sophia Antipolis: D. Scapin
- Third International Conference on ICT and Accessibility (ICTA 2011) Tunis (Tunisia) May 5-7, 2011: D. Scapin
- 1st International Workshop on Supportive User Interfaces (SUI 2011). within 3rd ACM SIGCHI Symposium on Engineering Interactive Computing Systems (EICS 2011), Pisa, Italy - June 13-16, 2011: D. Scapin
- HCI International 2011, the 14th International Conference on Human-Computer Interaction, Orlando, Florida, USA, in July 2011: D. Scapin
- HCD 2011 2nd International Conference on Human Centered Design ; in the context of HCI, Orlando, Florida, USA, in July 2011: D. Scapin
- EPIQUE 2011 (Colloque de Psychologie Ergonomique) September 5-7 à Metz: D. Scapin
- INTERACT 2011, 13th IFIP TC13 Conference on Human-Computer Interaction, Lisbon, Portugal, September 5-9, 2011 : D. Scapin
- PUX2011 (5th Workshop on Software and Usability Engineering Cross-Pollination), Lisbon, Portugal, September 5-9, 2011: D. Scapin
- EUTIC "Transformation des organisations, évolution des problématiques", Bruxelles 23-25 novembre 2011: D. Scapin
- IEEE ICE conference (Int’l Conference on Engineering, Technology and Innovation): M. Pallot (Editorial committee): B. Trousse (Int reviewing Panel)
- UPA2011 Conference “Design for Social Change”, Atlanta, June 2011: A.-L. Negri

7.1.4. Organization of Workshops and Conferences

- Lift France 2011 conference (July 2011 in Marseille): Facilitation of an **Aloha! workshop** (organizer A-L Negri in relation with T. Marcou from Fing) with 35 participants in order to test the method with creative audience. <http://liftconference.com/fr/lift-france-11/workshops/nous-sommestous-des-capteurs>
- World Usability Day 2011 (November 2011 in Sophia Antipolis): Facilitation of an **Aloha! workshop** for 22 participants (organiser: A-L Negri). Participants from various innovation and R&D teams reported positively the experience and were surprised by its efficiency. <http://www.use-age.org/journee-mondiale-de-l-utilisabilite/wud-2011/atelier-aloha>
- AxIS (M. Pallot and B. Trousse) as member of the ICT Usage lab collaborates to the organization of the **Living Lab Track at ICE 2011**, the 2011 edition of the ICE International Conference on Concurrent Engineering: the thematic Domain Network [68] and the concept of "Common Asset" key element for the thematic Domain Network [81]

Panelist and participants were involved also in a interactive session to analyse what can be done with the establishment of Domain Networks and how the relevant phases can be achieved.

- **LLSS2011**, the Second European Living Labs Summer school in Cornella, 29 August – 2 September 2011: M. Pallot and B. Trousse were members of the international organizing team. M. Pallot was chair and organizer of The Core Workshop on "Living Lab State of the Art" (M. Pallot as chair and organizer).

7.1.5. Participation in PhD Thesis Committees

AxIS researchers were members of the following Ph.D. committees in 2011:

- **B. Trelhu**, Ph.D, Modélisation, analyse et comparaison de procédures bchirurgicales, application à la neurochirurgie, June, University Rennes 1: Y. Lechevallier
- **O. Merroun**, Ph.D, Traitement à grande échelle des données symboliques, July, University Dauphine: Y. Lechevallier
- **I. Abid**, Ph.D, Modélisation de la prévision de défaillance des entreprises par des approches statiques et dynamiques : Réseaux de neurones réseaux bayésiens, modèles de durée et dichotomiques, July, University Paris 10 Paris-Ouest Nanterre La Défense: Y. Lechevallier
- **C. Zhang**, Ph.D., Mining data streams: clustering and pattern extraction, University of Nice-Sophia Antipolis & INRIA : F. Massegia (director), October , B. Trousse
- **T. Amouh**, Ph.D, Analysis of tabular non-standard data with decision trees, and application to hypnogram-based detection of sleep profile, December, University Namur (FNDP), November: Y. Lechevallier
- **E. Smirnova**, Ph.D, Network-based solutions for expert finding, University of Nice Sophia-Antipolis & INRIA, December: B. Trousse

7.1.6. Invited Talks

Marc Pallot was invited speaker at CLMPS 2011 (Congress of Logic, Methodology and Philosophy of Science), Nancy, 21-22 July 2011, at the IUHPS (International Union of History and Philosophy of Science Joint commission Symposium) session on "Development of Cognition in Technology and Technosciences". Presentation title "Group Cognition within Living Lab Research and Innovation, the Cycle of Experiential Knowledge".

7.1.7. Involvement in Regions

PACA Region

- B. Trousse and B. Senach are members of the coordination committee of the ICT Usage Lab (INRIA, CSTB, Orange Labs and UNS).
- B. Senach and B. Trousse pursued the reactivation started in 2008 of the living lab ICT Usage Lab by increasing our contacts with territories (NCA, CASA, CG06) and with the University Of Nice Sophia Antipolis disseminating the living lab approach and/or involving them as supporters or partners of ICT usage Lab projects.
- AxIS as ICT Usage Lab Member has established relations with the urban community of Nice Cote d'Azur (NCA) mainly related to their numeric ecosystem project (PACALABS 3), the Fireball european action (FP7), the ELLIOT european project (FP7) and to some future projects (pacalabs Eco-families, Ecocité project) as well as this urban community of Antibes Sophia Antipolis (CASA) on transportation: information systems (TIC TAC) and energy (Ecoffices). Subjects: user involvement, usage analysis, service evaluation and experiments, co-creation with citizen.
- AxIS maintained his contacts with CRT Tourism PACA and Provincia of Impera (Italy).
- B. Trousse as INRIA representative is a member of the expert committee of the Pacalabs and to the strategic committee of the Pacalabs orientation of the Regional Council.
- B. Trousse was invited by P. Mallea to participate to the Open Innovation workshop and living lab organised by Poe SCS and CNR Santé, NICE (28 June 2011).
- B. Senach and A-L Negri attended the FabLab day (November 18) Aix-en-Provence organised by FING.

Others Regions

- AxIS (D. Scapin) is involved in Process 2.0 project where the Midi-Pyrénées region and Limousin Region are pilots.
- B. Trousse was invited in december to participate in a working meeting related to a living lab project for Gran Lyon territory.
- B. Trousse was invited by C. Colucci in a round table "Espaces publics: living labs, co-working, comment innover avec les citoyens?" at les Interconnectés 2011 - Réseau des territoires innovants in Lyon (december 2nd).
- B. Trousse as co-animator of the french network of living labs organised two meetings in Paris in order to create a new 1901 association called "France Living Labs" (<http://www.france-livinglabs.fr>) facilitating mutualisation between living labs and increasing our visibility.

7.2. Teaching and Supervision

7.2.1. Teaching activities

Y. Lechevallier

Master 2 Recherche *Systemes intelligents* (resp: S. Pinson), University at Paris IX-Dauphine, France. Yves Lechevallier taught a course on "Du data mining au knowledge mining" (12h).

Master 2 Pro *Ingénierie de la Statistique* (resp: G. Saporta) at CNAM (Conservatoire national des arts et métiers), France. Yves Lechevallier taught a course on "Méthodes neuronales" (12h).

ENSAE (Ecole Nationale de la Statistique et de l'Administration Economique): Yves Lechevallier taught a course on Data Mining (18h).

ENSG: Yves Lechevallier taught a course on Clustering (12h).

7.2.2. PhD Thesis

AXIS is a associated team of the STIC Doctoral school of the Nice-Sophia Antipolis University (UNS). Our PhD students come from the University of Paris Dauphine, the University of Nice Sophia Antipolis, the Université Catholique de Louvain, the University of Recife (Brazil) and from various Universities of Morocco and of Tunisia.

Two PhD have been defended this year:

PhD : **E. Smirnova**, "Network-based solutions for expert finding" [18], University of Nice-Sophia Antipolis & INRIA, december 15, (co-directors: M. Rueher, B. Trousse with the participation of K Avrachtechov).

PhD: **C. Zhang**, "Mining data streams: clustering and pattern extraction" [19], University of Nice-Sophia Antipolis & INRIA, October (director: F. Masseglia).

3 PhDs under progress: B. Trousse participates in supervising three PhD students from Morocco in the context of the WRUM project related to data mining in e-learning: **M. Naamany** and **N. Sael** (University of Casablanca supervised by A. Marzark) and **E Zemmouri** (University of Fes and ENSAM Meknès, Morocco supervised by H. Behja and A. Marzark).

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