informatics / *mathematics*

Inria

Activity Report 2012

Project-Team AXIS

Usage-centered design, analysis and improvement of information systems

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Project-Team AXIS

Keywords: Data Mining, Knowledge Engineering, Social Networks, User Interface, Big Data, Living Labs, Sensors, Cognition, Experiments, Environment

AxIS is a multidisciplinary team bilocated at Sophia Antipolis and Rocquencourt.

Creation of the Project-Team: July 01, 2003 .

1. Members

Research Scientists
Marc Csernel [On leave from Univ. Paris IX Dauphine until August, Paris - Rocquencourt]
Thierry Despeyroux [CR1 Inria, part-time 70%, Paris - Rocquencourt]
Yves Lechevallier [Vice-Team leader, DR2 Inria, Paris - Rocquencourt]
Dominique Scapin [DR2 Inria, Paris - Rocquencourt]
Bernard Senach [CR1 Inria, Sophia Antipolis - Méditerranée]
Brigitte Trousse [Team Leader, CR1 Inria, Sophia Antipolis - Méditerranée]

Engineers
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Florian Bonacina [HOTEL-REF-PACA and ELLIOT contracts, Sophia Antipolis - Méditerranée]
Claudia Detraux [PIMI contract, Paris - Rocquencourt]
Mohamed Gaieb [ELLIOT contract, FocusLab until July, Sophia Antipolis - Méditerranée]
Carole Goffart [TIC TAC contracts until March, Sophia Antipolis - Méditerranée]
Ehab Hassan [HOTEL-REF-PACA until February, IDEAS from March to August, Paris - Rocquencourt]
Mylène Leitzelman [ELLIOT contract, 40 % par, Sophia Antipolis - Méditerranée]
Anne-Laure Negri [ELLIOT contract, 80 % part-time, Sophia Antipolis - Méditerranée]
Marc Pallot [FIREBALL contract, 20 % part-time until August and associated partner from September, Sophia Antipolis - Méditerranée]
Guillaume Pilot [TIC TAC and ECOFFICES contracts, Sophia Antipolis - Méditerranée]
Caroline Tiffon [ELLIOT contract, until July then part-time from August, Sophia Antipolis - Méditerranée]

Administrative Assistants
Nelly Bessega [Temporary staff, part time 50% until May 31, Sophia Antipolis - Méditerranée]
Nathalie Gaudechoux [AI Inria, part-time 50 %, Paris - Rocquencourt]
Delphine Robache [Temporary staff, part time 50%, Sophia Antipolis - Méditerranée]

Other
Bruno Almeida Pimentel [Internship from May to October, Paris - Rocquencourt]

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 KDD [1] 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. The last third period, we are putting our main efforts in the sub-objective 3 related to methods and tools for designing and evaluating user experience and supporting user-oriented innovation. In this period a great effort concerns 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:

- **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.
  In traditional Data Mining applications the representation of the data is a vector of Rp where p is the number of descriptors. In Web Mining the navigation must be represented by a ordered list of Rp 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 non vectorial representations, called complex data. The main subject matters in sub-objective 1 are data stream mining, complex data clustering, semantic data mining.

- **Sub-objective 2 - Information and Social Networks Mining for supporting Information Retrieval** : Related to information retrieval, we managed three main problems in the past: case-based recommender systems for supporting information search, expert finding whose goal is to identify persons with relevant experience from a given domain and entity extraction. Concerning social networks mining, 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.,

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[1] KDD: Knowledge Discovery From Databases

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.

- **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] 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 labs with large number of heterogeneous people instead of carefully controlled panels of users. These deep changes require to adapt existing methodologies and to design new ones. So, to address these new requirements, we identified the following research :

  – Conceptual studies: state-of-the-art investigations covering the Living Lab landscape, the future internet domain landscape, the future user-open innovation for smart cities, user experience. These studies provide insight on methodological aspects for needs analyses, 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. Let us cite the folloxing methods ad tools:
    a) Methods ad tools for idea generation processes

    b) Usability methods and tools: coupling usability design methods with data mining techniques, evaluation methods

    c) User Experience design and evaluation methods and tools

  – FocusLab Experimental Platform (CPER Telius) (cf. section 5.6 dor the software part) is our delivery mechanism providing access to AxIS methodology and software for the scientific community.

For scientific foundations for some topics of sub-objectives 1 and 2, see our 2007 AxIS activity report.
All our research work (data and methods) is mainly applied in the context of Living Labs (cf. section 3.1).

2.2. Highlights of the Year

- Y. Lechevallier was scientific chair of the most important francophon conference in Knowledge Management and Extraction (EGC) in 2012 [39].

- Creation of the association France Living Labs (May): the french network of living labs (labelled by ENoLL) has decided with a majority in 2011 (after the 5th wave) to create an association due to their growing number in order to promote the French Living Labs and to facilitate user-driven open innovation at a national level. ICT Usage Lab (cf. section 6.1.8) is co-founder of France Living Labs with 20 other founders such as CNED, competivness clusters (Cap Digital, Image et reseaux), Lorraine Smart cities living Lab, Universcience, Urban Living Lab, etc. (cf. section 6.2.4). ICT Usage Lab is represented officially by B. Trousse (Inria) as permanent representative and A. Zarli (CSTB) as suppleant in the administration council.

- B. Trousse was elected President of France Living Labs.

- This year, AxIS experiments its Action-Research approach with more than ten workshops with citizen and/or professionnals (in the context of three contracts TIC TAC, ELLIOT and ECOFAMILIES) and mainly for the two first steps of a living lab process - the co-creation and/or exploration steps. Such an experience was very fruitful to identify the main research problems in deploying a living lab process and in designing and evaluating user experience in order to support user behaviour changes (cf. section 5.5).

- The ACM SIGSOFT 2012 Impact Paper Award has been attributed to Th. Despeyroux and his co-authors for a paper published in 1989: "CENTAUR: the system" [72].

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[2]CAI: Computer Based Innovation

3. Application Domains

3.1. Panorama: Living Labs, Smart Cities

AxIS addresses applicative field which has the following features:

a) requiring 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 service/product used with data mining techniques and knowledge management

- for social network analysis (for example in Web 2.0 applications, Business Intelligence, Sustainable Development, etc.)

b) requiring user-driven innovation methods.

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**) (cf. section 5.5.5 which imply user involvement for the generation of 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.

Our experience particularly stressed on the following applicative domains:

- Transportation systems & Mobility (cf. section 3.2),

- Tourism (cf. section 3.3),

- User Involvement in Energy, Environment, Well Being & Health and e-governement (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. In addition to development of sustainable transportation systems (better ecological vehicles' performance, reduction of impacts on town planning ...) these improvements concern also mobility management, that is specific measures to encourage people to adopt new mobility behaviour such as public transportation services rather than their personal car. These prompting measures concern for instance 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.

Since 2004, AxIS has been concerned with mobility projects :

- 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 to apply AxIS' know-how in data and web mining to the field of transportation systems.

- Traveller's information systems and recommender systems have been studied with the evaluation of two CASA web sites : the "Envibus" web site which provides information about a bus network and the "Otto&co" web site support car-sharing.

- Advanced transportation systems has been studied in PREDIT TIC TAC (2010-2012): this project (cf. section 6.1.1) aimed at optimizing travel time by providing in an aera with weak transportation services, a just in time on demand shuttle based on real time information. It was for AxIS the opportunity to experiment user implication in the design of a new travel information system called MOBILTIC

- User Experience: in the ELLIOT project (cf. section 6.3.1.1), the mobility scenario is addressed in relation to information on air quality and noise and the use of internet of things.

3.3. Tourism

As tourism is a highly competitive domain, local tourism authorities have developed Web sites in order to offer of 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 is involved related mainly to **Semantic Web Mining** [3]. In our case, a) we exploit ontologies and semantic data for improving usage analysis, personnalised services, the quality of results of search engines and for 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) based on CBR*tools).

- In the context of HOTEL-REF-PACA project (cf. section 6.1.2, we aimed to better refer the web sites of hotels/campings from the region of TOURVAL in PACA (mainly Vésubie territory), with an approach based on a better understanding of usage from the internauts. To address this, we proposed and adopted a multidisicplinary approach combining various AxIs know-how: knowledge engineering (ontology in tourism), data mining (analysis of Google logs, hotel web site logs and user queries, visual behaviours from eye tracker), Ergonomics (clustering of hotel web sites based on their ergonomical quality).

- Several contacts (PACA, France Living Labs, Island of the Reunion) have been done related to projects in tourism and eco-tourism.

3.4. User Involvement in Energy, Environment, Health and E-governement

Below are some topics where AxIS was or is involved in:

- **Preprocessing and analysing collective usage data and social networks** from group discussions related to design process: cf. ANR Intermed (2009) and FP7 Elliot (cf. section 6.3.1.1) where citizen generate ideas in terms of specific environmental sensors based services according to their needs.

- **Methods and tools for supporting open innovation based on public data**: a first work was made in 2010 with the CDISOD Color action related Public Data in collaboration with Fing (Marseille) and ADEME (Sophia Antipolis). We pursue such a study in the context of FP7 Elliot by providing to citizen environnemental data (air quality and noise) issued from citizen and/or territories sensors.

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[3]By Semantic Web Mining, we mean the mutual benefits between two communities Semantic Web and Web Mining

All AxIS topics are relevant for these domains. let us cite: social network analysis, personalization and information retrieval, recommender systems, expert search, design and evaluation of methods and tools for open innovation and user co-creation in the context of Living Labs, usage mining, mining data streams.

We have addressed specific works:

- Energy (cf. section 6.1.3): the main AxIS topic here was usage analysis in the context of an energy challenge in an enterprise (ECOFFICES) taking into account the complex and real situation (installation fo more than 400 sensors, differences between the three concerned teams, differences between the offices). Such an analysis aims to correlate team/office energy consuming, team/office eco-responsible behaviours and team/office profile.

- Health (cf. section 3.4): Axis contributed in 2011 to a Living Lab characterisation in Health domain through the visit of several Living Labs, which operate in the domain of Health and Autonomy, and conducted interviews. This work was done in relation with the CGIET [4].

- 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 PIMI [5] project (cf. section 6.2.1) 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 augment 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.

Some of our results are under process to be part of the FocusLab platform (CPER Télius 5.6) which is based on a Service oriented Architecture. The development process of the software part has started in 2011, finding ways to fund human ressources. Such a platform aims the community of Living Labs domain. In [70], we report the usage of the FocusLab platform (hardware and software components) inside various regional and european projects..

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:

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[4]CGIET: "Conseil Général de l'Economie, de l'Industrie, de l'Energie et des technologies" http://www.cgeiet.economie.gouv.fr
[5]Personal Information Management through Internet

Supervised methods

- a Java library (Somlib) that provides efficient implementations of several SOM(Self-Organizing Map) variants [77], [76], [101], [100], [104], especially those that can handle dissimilarity data (available on Inria's Gforge server (public access) Somlib, developed by AxIS Rocquencourt and Brieuc Conan-Guez from Université de Metz.
- a functional Multi-Layer Perceptron library, called FNET, that implements in C++ supervised classification of functional data [96], [99], [98], [97] (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 [84]. 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 [74] (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 [75]).

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

Previous versions of the above software have been integrated in the SODAS 2 Software [95] which was the result of the european project ASSO [6] (2001-2004). SODAS 2 supports the analysis of multidimensional complex data (numerical and non numerical) coming from databases mainly in statistical offices and administration using Symbolic Data Analysis [71]. This software is registrated at APP (Agence de la Protection des Programmes). 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 [78], [85].

As a 2012 result, a release of MND (Dynamic Clustering Method for Multi-Nominal data) algorithm based on previous AxIS research (2003) has been done (cf. section 5.6).

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 [103] for more details) in collaboration with F. Masseglia and B. Trousse :

- **Cluster & Divide**,
- and **Divide & Discover** [11].

These methods have been successfully applied from 2005 on various Web logs.

4.2.3. *Mining Data Streams*

Participants: Brigitte Trousse [correspondant], Mohamed Gaieb.

In Marascu's thesis (2009) [91], 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.

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[6]ASSO: Analysis System of Symbolic Official data

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 and a C++ version has been implemented by F. Masseglia 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) in the context of MIDAS project (Java version).

In 2011, in the context of the ELLIOT contrcat [cf. Section 6.3.1.1], SCDS has been integrated as a Web service (Java version) in the first version of FocusLab platform (cf. section 5.6) in the ELLIOT context: a demonstration was made on San Rafaelle Hospital media use case at the first ELLIOT review at Brussels.

In 2012 we applied SCDS web service on data issued from co-creation step of two use cases in Logistics (BIBA) and Green Services (ICT Usage Lab). More data are needed to show the relevance of this method, it is planned in 2013 with the experimentation step of Green Services.

The three C++ codes done for the CRE (Orange Labs) have been depositi at APP.

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 House) for Web Usage Mining (WUM) is issued from AxISlogminersoftware which implements the mult-site log preprocessing methodology and extrcation of sequential pattern with low support developed by D. Tanasa in his thesis [15] 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. The web log files are cleaned before to be used by data mining methods, as they contain many noisy entries (for example, robots requests). The data are stored within a database whose model has been improved.

So AWLH 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 additionnal tool has been developped 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 [correspondant].

ATWUEDA for Web Usage Evolving Data Analysis [80] was developed by A. Da Silva in her thesis [79] 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 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.of ATWUEDA (september 2009) is available at Inria's gforce website.

In 2011 we have demonstrated the efficiency of ATWUEDA [82] by applying it on another real case study on condition monitoring data streams of an electric power plant provided by EDF.

ATWUEDA is used by Telecom Paris Tech and EDF [4].

This year we studied how to transform the code of ATWUEDA as a web service for the version 1.2 of FocusLab: in fact we gave up this objective, which would require more resource than we have.

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 [87], [88] is an object-oriented framework [89], [86] 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'thesis [87], 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.

This year a new version v1.2 of K-MAD was released in december. Its history, documentation and tool are available at: http://kmade.sourceforge.net/index.php. This work follows up the findings from the work of Caffiau and al. [73].

5. New Results

5.1. Introduction

As planned, our new results are splitted into our three sub-objectives as introduced below:

5.1.1. *Mining for Knowledge Discovery in Information Systems*

This year we get six main results: one related to how to integrate domain knowledge in a multi-view KDD process (cf. section 5.2.4), two on new KDD methods involving clustering (cf. sections 5.2.3 and 5.2.2), one on the construction of hierarchical structures of concepts in the field of e-tourism (cf. section 5.2.6), one on partitioning objects taking into account simultaneously their relational descriptions given by multiple dissimilarity matrices (cf. section 5.2.1), and finally improvment of our work on critical edition of Sanskrit texts (cf. section 5.2.5).

- Zhang based on his thesis (2010) has published this year his work on modeling and clustering users with evolving profiles in usage streams [32]. This paper will propose three models to summarize bi-streaming data, which are the batch model, the Evolving Objects (EO) model and the Dynamic Data Stream (DDS) model. Through creating, updating and deleting user profiles, the models summarize the behaviours of each user as an object. Based on these models, clustering algorithms are employed to identify the user groups. The proposed models are tested on a real-world data set showing that the DDS model can summarize the bi-streaming data efficiently and effectively, providing better basis for clustering user profiles than the other two models.

- The work described in 2011(see our AxIS annual report) on critical edition of Sanskrit texts and submitted as a paper at the Cicling 2012 conference has been accepted [21].

- A past work accepted in an international journal with A. Ciampi and colleagues [16].

- One article in an international conference on functional data analysis issued from a collaboration with F. Rossi [40].

- Two articles have been deposit in the Computing Research Repository (CoRR): one on clustering Dynamic Web Usage data [65] from A. Da Silva's thesis and one on functional data analysis [66].

5.1.2. *Information and Social Networks Mining for Supporting Information Retrieval*

This year, we pursued two main works on clustering methods:

- the detection of communities in a social network (graph extracted from relationnal data) (cf. section 5.3.1),

- the improvment of our dynamic hard clustering method for relational data (cf. section 5.3.2).

5.1.3. *Multidisciplinary Research For Supporting User Oriented Innovation*

With the expansion of the innovation community beyond the firm's boundaries (the so-called "open innovation") a lot of changes have been introduced in design and evaluation processes : the users can become co-designers, HCI design and evaluation focus is no longer placed on usability only but also on the whole user experience, experimentations take place out of lab with large number of heterogeneous people instead of carefully controlled panels of users ... All these deep changes require improvements of existing practices, methods and tools for the design / evaluation of information systems as well as for usage analysis. This evolution calls also for a structured user centered methodology (methods and ICT tools) to deal with open innovation. Various different disciplines and trends are dedicated in understanding user behavior on Internet and with Digital Technologies, notably Human Computer Interaction community (HCI), CSCW, Workplace Studies, Distributed Cognition and Data Mining. Our contribution to open innovation research keeps its focus on usage analysis for design, evaluation and maintenance of information systems and our activities this year, as indicated in our roadmap presented at the Inria theme evaluation (2011) have been conducted both breadth wise and in depth with two main objectives :

- Improving, designing and evaluation support tools for innovation,
- Development of the FocusLab platform.

The research was conducted along three focus:

- Extension of usability methods and models (cf. section 5.4),
- Designing and evaluating user experience in the context of a living lab process (cf. section 5.5),
- FocusLab Platform (cf. section 5.6).

Let us note one research work related to Living labs done in 2011 and published in 2012 [26].

5.2. Mining for Knowledge Discovery in Information Systems

5.2.1. *Clustering on Multiple Dissimilarity Matrices*
Participants: Yves Lechevallier, F.A.T. de Carvalho, Guillaume Pilot, Brigitte Trousse.

In [17], we introduce hard clustering algorithms that are able to partitioning objects taking into account simultaneously their relational descriptions (relations + values) given by multiple dissimilarity matrices. 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.

During 2012 we show interest and disadvantages of these approaches to classifying curves with a Urso and Vichi distance based on the mathematical properties of curves (first derivative and second). The curves are issued from temperature sensors placed in 40 offices during one year (See section 6.1.3). This period was divided into the periods before and after challenge and the challenge period. During the challenge period the occupants had information by bonus / malus messages on energy consumption [34].

5.2.2. *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. We pursued our previous work [102] and defined a new approach of knowledge extraction using graph theory. which is described in [29].

This work is done in collaboration with the laboratory LRIA At the Ferhat Abbas University, Sétif, Algérie.

5.2.3. *Multi-criteria Clustering with Weighted Tchebycheff Distances for Relational Data*
Participants: F.A.T. de Carvalho, Yves Lechevallier.

The method described in [27] uses a nonlinear aggregation criterion, weighted Tchebycheff distances, more appropriate than linear combinations (such as weighted averages) for the construction of compromise solutions. We obtain a partition of the set of objects, the prototype of each cluster and a weight vector that indicates the relevance of each criterion in each cluster. Since this is a clustering algorithm for relational data, it is compatible with any distance function used to measure the dissimilarity between objects.

5.2.4. *Knowledge management in Multi-View KDD Process*
Participant: Brigitte Trousse.

E.L. Moukhtar Zemmouri, in the context of his PhD thesis supervised by Hicham Behja, A. Marzark and B. Trousse pursued his work based on a Viewpoint Model in the context of a KDD process [30], [19].
Knowledge Discovery in Databases (KDD) is a highly complex, iterative and interactive process aimed at the extraction of previously unknown, potentially useful, and ultimately understandable patterns from data. In practice, a KDD process (data mining project according to CRISP-DM vocabulary) involves several actors (domain experts, data analysts, KDD experts, etc.) each with a particular viewpoint. We define a multi-view analysis as a KDD process held by several experts who analyze the same data with different viewpoints.
We propose to support users of multi-view analysis through the development of a set of semantic models to manage knowledge involved during such an analysis. Our objective is to enhance both the reusability of the process and coordination between users.
To do so, we propose first a formalization of viewpoint in KDD and a Knowledge Model that is "a specification of the information and knowledge structures and functions involved during a multi-view analysis". Our formalization, using OWL ontologies, of viewpoint notion is based on CRISP-DM standard through the identification of a set of generic criteria that characterize a viewpoint in KDD. Once instantiated, these criteria define an analyst viewpoint. This viewpoint will guide the execution of the KDD process, and then keep trace of reasoning and major decisions made by the analyst.
Then, to formalize interaction and interdependence between various analyses according to different viewpoints, we propose a set of semantic relations between viewpoints based on goal-driven analysis. We have defined equivalence, inclusion, conflict, and requirement relations. These relations allow us to enhance coordination, knowledge sharing and mutual understanding between different actors of a multi-view analysis, and reusability in terms of viewpoint of successful data mining experiences within an organization.

5.2.5. *Critical Edition of Sanskrit Texts*
Participants: Yves Lechevallier [correspondant], Marc Csernel, Ehab Assan.

With the help of Ehab Assan we improved the prototype made last year by Nicolas Bèchet (cf. 2011 AxIS activity report,[21]). It is now included in the construction process of critical editions of Sanskrit texts. Ehab also added LaTeX output to the process, we now have paper as well as Web output. It was possible to present these new features [33], [36] at the 13th International Conference on Intelligent Text Processing and Computational Linguistics (CICLing) in Delhi.

5.2.6. *Construction and Settlement of hierarchical Structures of Concepts in E-tourism*
Participant: Yves Lechevallier.

The work of Nicolas Bechet (AxIS member in 2011) and Yves Lechevallier in collaboration with Marie-Aude Aufaure (Ecole Centrale de Paris), was published in 2012 [20] related to a method for the construction and the automatic settlement of hierarchical structures of concepts. We were particularly interested in the construction of a hierarchical structure of services offered in Hotels from a data set of an application in the field of e-tourism motivated by our contacts with the SME Addictrip. The goal is to associate to each service a concept that provides a common representation of all services. Our experiments are carried out using resources from partners specialized in online hotel booking, in particular from Addictrip. The establishment of a structure of concepts is essential to these partners that use their own terminologies description of hotel services. Indeed it provides a common representation space allowing the comparison of service coming from different resources. Our approach is based on proximity of literal terms in the service having a nearby measure based on n-grams of characters. The results during our experiments show the quality of this approach and its limitations.

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, Bruno Almeida Pimentel.

The automatic detection of communities in a social network can provide a kind of graph aggregation. The objective of graph aggregations is to produce small and understandable summaries and it 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.

During this year many updates of the program developed by Louati Amine in 2011 were performed by Bruno Almeida Pimentel. A book chapter, included the new aggregation criteria proposed ans evaluted by Bruno Almeida Pimentel, was written and will be published in 2013.

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

5.3.2. *Multi-View Clustering on Relational Data*

Participants: Thierry Despeyroux, Yves Lechevallier.

In the work reported in [23] in collaboration with Francisco de A.T. de Carvalho, we introduce an improvement of a clustering algorithm described in [17] that is able to partition objects taking into account simultaneously their relational descriptions given by multiple dissimilarity matrices. In this version of the prototype clusters depend on the variables of the representation space. These matrices could have been generated using different sets of variables and dissimilarity functions. This method, which is based on the dynamic clustering algorithm for relational data, is designed to provided a partition and a vector of prototypes for each cluster as well as to learn a relevance weight for each dissimilarity matrix by optimizing an adequacy criterion that measures the fit between clusters and their representatives. These relevance weights change at each algorithm iteration and are different from one cluster to another. Moreover, various tools for the partition and cluster interpretation furnished by this new algorithm are also presented.

Two experiments demonstrate the usefulness of this clustering method and the merit of the partition and cluster interpretation tools. The first one uses a data set from UCI machine learning repository concerning handwritten numbers (digitalized pictures). The second uses a set of reports for which we have an expert classification given a priori. which we have an expert classification given a priori.

5.4. Extension of Usability Methods and Tools

5.4.1. *User Evaluation and Tailoring of Personal Information*

Participants: Claudia Detraux, Dominique Scapin.

In the context of the ANR project PIMI (Personal Information Management through Internet see section 6.2.1), ergonomic inspections have been carried out to evaluate the usability of the PIMI V0.1. prototype, in its PC and mobile versions [49], [48]. Also, an experiment [24], [35] was conducted on a mockup of a Personal Information Space. Users were asked to perform scenario-based data entry and retrieval tasks, then to modify the mockup according to their wishes and needs. The results allowed to validate the item content and structure for the future personal space, as well as to assess the role of user modifications as evaluation cues, and for the development of further ergonomic recommendations. Detailed information was obtained on how users enter and retrieve data, by modifying the interface settings and shows that the adaptable nature of a Personal Information Space can indeed influence its acceptance, and provides useful cues for ergonomic evaluation

5.4.2. *Usability Methods for Information Visualization*

Participant: Dominique Scapin.

A collaboration between UFRGS (Federal University of Rio Grande do Sul, Institute of Informatics), Brazil and Inria-AxIS led to a book chapter [37] dealing with potential methodologies for including a user-centered approach into information visualization techniques. It starts by presenting the evolution of visualization techniques evaluation, briefly summarizing the main contributions in this area since its humble beginning as a collateral activity until the recent growth of interest. Then, the focus is on current issues related to such evaluations, particularly concerning the way they are designed and conducted, taking into account a background of well-known usability evaluation methods from HCI to help understanding why there are still open problems. A set of guidelines for a (more) user-centered usability evaluation of information visualization techniques is proposed and discussed.

5.4.3. *Usability Recommendations for MIS (Mixed Interactive Systems)*

Participant: Dominique Scapin.

A collaboration between University of Toulouse – IUT Tarbes, IRIT and Inria-AxIS led to a book chapter [38] dealing with Mixed Interactive Systems (MIS) which denote an advanced form of interaction that aims at combining physical and digital worlds, such as mixed and augmented reality, tangible user interfaces, ubiquitous computing, etc. Their main interest relates to the use of physical artifacts from the user's activity customary context. The book chapter first reports on a systematic review of the literature on MIS evaluation. From that review, usability recommendations were selected and deciphered before reformulating them under a common format. Finally, three different classification schemes of the usability recommendations obtained are proposed to facilitate search and retrieval, but also to better integrate them into the MIS development process.

5.5. Designing and Evaluating User Experience and Methods for Open Innovation

5.5.1. *From Usability to User Experience: an HCI Review*

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

Through an extensive review of the literature, a paper [28] attempted to characterize a rather novel and popular view on human-computer interaction: User Experience (UX). After introducing its polysemous nature, this paper describes the origins of UX, its scope, underlying concepts and components, as well as its various definitions. Then, UX methods are surveyed and classified, distinguishing processes, frameworks, and specific methods. The paper identifies a set of issues about the needs for increased UX maturity. Even though UX can still be viewed as an extension of usability, its future may correspond to a paradigm evolution rather than simply a buzz word. The evolution is not drastic, but it adds complexity (including new measurements) by considering a few more user areas than traditional usability.

5.5.2. *Evaluation of our Methods for Idea Generation Process*

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

In 2011 we proposed a methodology coupling two methods [25] (GenIoT a generative method based on probes (fake sensors and/or actuators) and ALoHa! a bodystorming method for designing service concepts in the specific paradigm of the Internet of Things (IoT). In the frame of the European project ELLIOT - Experiential Living Lab for Internet Of Things -, ICT Usage Lab (cf. section 6.1.8) aims at co-creating "green" services, i.e. services based on air quality and noise measurement.

Both IoT ideation methods Aloha! and GenIoT were used for the co-creation of health related services (cf. section 6.3.1.1). The participants of the methods were Environment and Health professional. Results were very different than the workshops run with citizen in the frame of the mobility scenario in ELLIOT (see 2011 AxIS activity report). Comparison of these workshops shows that hybrid approaches –i.e. co-creation approaches mixing both real and virtual meetings are not working as well as pure face to face or pure online approaches. Moreover, GenIoT method seems to be more effective with citizen than with professional. Aloha! is effective in both groups but more efficient with professionals. However the participant experience of Aloha! is higher in the case of citizen (mainly because professionals are not used to practice creative thinking methods and do not appreciate to go out of their comfort zone).

5.5.3. *Leading People Behavior Changes: Mining Evolutive Data*

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

The ECOFFICES project (cf. [62], [22] and section 6.1.3) was for AxIS project team our first step towards eco-behavior study. It provided us a very rich context to study how to analyse the evolution of the energy consuming of employees during an energy challenge. A qualitative analysis from questionnaires (before and after the challenge) has been done as well quantitative analysis. The data set for quantitative data is composed of heterogeneous data issued from around 400 sensors (temperature, presence, behavior in terms of opening doors, windows, bonus, malus, etc.). We made different studies related to data preprocessing and data analysis. In our first study [64], we cleaned the data set and selected reliable data for data analysis (only temperature of various equipments, user presence and bonus/malus points). We decided not to work with aggregated variables such as the initial ponderation (defined by partners) for the various bonus-malus rules and the energy consuming at the office level. We decided to use (office, day) as statistical unit (i.e. 9995 units) with a vectoral representation. Finally we realized that the three initial periods (before the challenge, during and after the challenge) on 379 days (2011-2012) should be in fact decomposed in five periods, due to the fact the first and the last periods were split into two subperiods (with and without heat). For the analysis, we apply for each (office,day) a first analysis on a vectorial representation of temperature with the MND method (cf. section focuslab) in order to identify the best partition of these. The MND method uses euclidean distance between each value of the vectorial representation and the prototypes are defined by the means. Second we did a clustering of these units based on bonus and malus and finally we made the correspondence between these two partitions. Three classes for (office, day) are obtained. The interpretation in terms of team relied difficult but we proposed various conclusions for a winner for managing a specific bonus, or in managing ambient temperature or in behavioral change.

In our second study [34] in collaboration with Francisco de A.T. De Carvalho, our goal was to improve the interpretation task at the office and team level by applying AxIS advanced methods. To do this, we applied our hard clustering method presented in [34] on this dataset where each office was characterized by two different representations:

- Interval representation: each office is characterized by a vector of intervals corresponding to the average, minimum and maximum of daily temperatures on the three temperature sensors during these five periods. Then the office is represented by a vector of 15 intervals and the distance used is Hausdorff distance. This classification is consistent with the partition into three classes obtained during the ECOFFICES project. The class obtained with nine eco-responsible ecoffices is the same. However, other offices are divided into two classes according to the type of heating used during the winter period. The classical method divided these offices into two clusters, one of which contains the offices using the radiators during the winter period.

- Sequential representation: Each office is characterized by a vector of 9 measures, the min, max and average of daily temperatures of the three sensors in these five periods. The values are ordinate versus time and the distance used is Urso and Vichi distance (adequate for curves). The results of this approach are quite different from the classical approach results. These results required more effort for their interpretation in collaboration by specialists.

5.5.4. *Leading People Behavior Changes: a Literature Review*

Participants: Bernard Senach, Anne-Laure Negri.

Our research towards eco-behavior study started with the ECOFFICES project (cf. sections 5.5.3 and 6.1.3 for more details) was recently complemented with a litterature review aiming at a deeper understanding of breaks and levers to eco behavior adoption. A first work was focused on the so-called "modal change problem", compiling methods and tools aimed at supporting people to use public transportation system rather than their personal car. A second work was initiated to get a better understanding of the role that users interface could play in encouraging people to adopt a specific behavior. This work is still in progress.

Eco mobility : prompting people to adopt public transportation mode rather than their personal car.

The first review of work conducted in the fields of Persuasive Communication, Commitment, Nudges and Persuasive Technology showed that behavioral change is a process with many steps requiring to support each step with specific means. For instance, if mass communication can support the public awareness of a problem, information is not sufficient to convince people to really change their behavior. It is necessary to push them to act and numerous well-known influence techniques are nowadays available. All recent technological development (geo localization, mobile devices, social networks) can provide very effective support for behavioral changes as far as they rely on design principles identified by research in Persuasive Technology. A presentation was done on this topic for GreenCode Forum [67] (see the video on youtube).

5.5.5. *Future of Internet and User-Open Innovation for Smart Cities*

Participants: Marc Pallot, Brigitte Trousse, Bernard Senach.

We pursued our work on this topic and contributed to a white paper [59] which is one of the main outcomes of the FIREBALL project [cf. section 6.3.1.2), a Coordination Action within the 7th Framework Programme for ICT, running in the period 2010-2012. The aim of this project was to bring together communities and stakeholders who are active in three areas, namely: research and experimentation on the Future Internet (FIRE); open and user-driven innovation in Living Labs; and urban development for smarter cities. The goal was to develop a common vision on how the different methodologies and concepts in these areas can be aligned for cities as playgrounds of open and user driven innovation related to the Future Internet.

The white paper addresses several aspects that are critical for understanding the 'smart city' concept and the current progress in this area. Based on cases studies and foresight reports we aim to shed light on how the concept of smart city is currently adopted by European Cities and what the ambitions and expectations are in using this concept. It investigates the drivers and bottlenecks that influence the transformation towards a "smart city". Underlying approaches to smart cities are discussed, both in terms of the strategies and planning approaches. From this point of view, this paper explores the conditions that must be established to stimulate the transformation towards smart cities, and the resources that are available or should be made available such as investments in broadband networks and in smart applications, as well as in the capabilities to innovate. This also points to the changing structures and processes of innovation and city development. Interestingly, we see a tendency towards more decentralized and bottom-up approaches to planning and innovation. Innovation ecosystems are characterized by a combination of top down and bottom up initiatives, leading to networking and collaboration among stakeholders, which eventually extend to real innovation communities. Increasingly, citizens, advanced businesses and local governments act as proactive catalysers of innovation, shaping cities as "agents of change".

5.6. FocusLab Platform

5.6.1. *FocusLab platform: software part*

Participants: Brigitte Trousse, Yves Lechevallier, Semi Gaieb, Xavier Augros, Guillaume Pilot, Florian Bonacina.

FocusLab v1.3 (software component) done inside the ELLIOT project (cf. section 6.3.1.1) and for the purposes of the CPER Telius (cf. section 6.1.5) corresponds to the design and the implementation of a set of web-services providing basic and advanced functionalities for data analysis and some other tools supporting the living lab process.

In this version, five data analysis web services are proposed including three generic web services: a classical linear regression and two AxIs methods:

- SMDS/SCDS [91]: SCDS (Sequence Clustering in Data Stream) is a clustering algorithm for mining sequential patterns (Java) in data streams developed by A. Marascu during her thesis. This software takes batches of data in the format "Client-Date-Item" and provides clusters of sequences and their centroids in the form of an approximate sequential pattern calculated with an alignment technique. We propose in this version to return the apparition frequency (min, max, average, slope) of a sequential pattern from data streams (SCDS algorithm) (see references

- GEAR for data streams compression [93], [91], [92], [94]: GEAR (REGLO in french) is an implementation of the history management strategy proposed in Marascu's thesis [1]. It takes a set of time series and provides a memory representation of these series based on a new principle, where salient events are important (in contrast to the recent events of decaying models) .

Other data analysis services and tools have been added for Living Labs needs. We propose also two clustering methods which must be downloaded as standalone software and used for mining data from living labs:

- ATWUEDA (Axis Tool for Web Usage Evolving Data Analysis) for Analysing Evolving Web Usage Data (Da Silva 'thesis 2009 [79], [83], [81], [82]) was developed in Java and uses the JRI library (http://www.r-project.org/). The ATWUEDA tool is able to read data from a cross table in a MySQL database, split the data according to the user specifications (in logical or temporal windows) and then apply the proposed approach in order to detect changes in dynamic environment. Such an approach characterizes the changes undergone by the usage groups (e.g. appearance, disappearance, fusion and split) at each timestamp. Graphics are generated for each analysed window, exhibiting statistics that characterizes changing points over time. This application for the next experiment of Green services use case is under study.

- MND method (Dynamic Clustering Method for Multi-Nominal Data) [90]: The proposed MND method (developed in C++ language) determines iteratively a series of partitions which improves at each step the underlying clustering criterion. The algorithm is based on: a) Prototypes for representing the classes; b) Representation space; c) Proximities (distances or similarities) between two individuals; d) Context-dependent proximity functions for assigning the individuals to the classes at each step. The clustering criterion to be optimized is based on the sum of proximities between individuals and the prototype of the assigning clusters.

  This method has been also successfully applied on Web logs in 2003. This year we improved our code and tested it on IoT data (temperature) issued from the ECOFFICES project (cf. sections 5.5.3 and 6.1.3).

The application of the services provided by FocusLab 1.3 and other AxIS data mining methods for the purposes of ELLIOT use cases and other experimental projects are under study.

6. Partnerships and Cooperations

6.1. Regional Initiatives

6.1.1. PREDIT (ADEME) TIC TAC (2010 - 2012)

Participants: Carole Goffart, Guillaume Pilot, Bernard Senach, Brigitte Trousse, Florian Bonacina.

> Title: TIC TAC
>
> Type: PREDIT groupe 3, Mobilité dans les régions urbaines
>
> Challenge: Information and Communication Technologies – Transportation
>
> Instrument: Mobilité dans les régions urbaines
>
> Duration: 2010 - March 2012
>
> Coordinator: VuLOG
>
> Others partners: MHC Conseils
>
> Abstract: TICTAC project aims at providing an advanced travellers' information system in which real time information about waiting time at bus stop will be avalaible: users define their "favourite" and can call a vocal server which give them immediately the requested information.

This year, we conducted a second experimentation with an improved version of real-time information system. Main modification were : a lighter interaction with the vocal server, simpler registration procedure, on-line memo ... The experiment started in January 2012 and lasted till end of February and 62 people registrated to the experiment [57]. The quantitative log analysis was articulated with two appreciation questionnaires. Results show that there was few access to the vocal server and a small rise of web server consultation in comparison with the first experimentation. The error rate and the response time were rather high and the users didn't have a very good experience with the service. The service was acknowledged as very useful and the user interface was perceived as easy to use but TICTAC didn't met its users expectations: very few of them used it on a daily basis [52], [51].

The second experimentation was also a good opportunity to test our new approach of co-creation and we conducted a workshop with users to identify functionalities of a real-time traveler information system and to test a first mock-up.

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 Accomodation Web Sitesi in PACA Region
>
> Instrument: PACALABS (Paca Region and FEDER 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 and hotel-keepers as well as 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.

Due to some delay in the experiment (mainly tag installation, data access), our task related to data analysis was postponed until May 2012. This year we conducted several eye tracking studies on different sites (general council 06 in Nice, Draguignan citizen space, Inria) in order to understand the visual search behavior when looking for ill-defined or well defined targets on a Google results page. The results show that commercial ads are rarely looked at and that for the intended users (touristic hosts) a good natural referencing is more efficient than commercial ads. The impact of ergonomic recommendations about web site users interface provided to hotel and restaurant owners participating in the project was evaluated. The pool showed that the participant had a deeper understanding of on line referencing and awareness of the weight of usability quality [54], [44], [42], [43], [45].

6.1.3. PACALABS ECOFFICES (2010 - 2012)

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

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, registered data are analysed 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.

The ECOFFICES project based on the concept of **energy challenge** in tertiary sector ended officially in november 2011, but due to the complexity of cleaning data before data analysis, we analysed usage data and IoT data up to February 2012. The final assessment showed that the participation rate was higher than expected. The most notable behavior change at the office concerns a declared increase of switching off of aircon and electrical devices when leaving the office for a long time. At the end of the challenge, participants were not convinced about effective savings and the sustainability of emergent eco-behaviour is questioned. Our main contribution is described in Section 5.5.3 and reported in three main deliverables related to the qualitative and quantitative analysis of experimental data, which are summarised in [64] and the final report [62].

6.1.4. PACALABS ECOFAMILIES (2011- 2012)

Participants: Xavier Augros, Florian Bonacina, Brigitte Trousse [correspondant].

Title: ECOFAMILIES

Type: PACALABS

Challenge: Design by end users of an user interface for energy savings

Instrument: PACALABS (Paca Region and FEDER fundings)

Duration: October 2011 - October 2012

Coordinator: CSTB

Others partners : University of Nice Sophia Antipolis (I3M), NCA

See also: http://www.ictusagelab.fr/projet/ecofamilies fro a summary of the mainoutcomes of the project.

The ECOFAMILIES project has proposed to prototype and experiment an innovative technological solution to promote energy-aware behaviors at home, through a participatory design approach. A web-based user interface has been developed by SME Ekenos (Italy). It provides a set of customized contents, ranging from basic information to proposal of actions aiming at reducing energy consumption.

ICT Usage Lab (cf. section 6.1.8) was a sponsor partner and was represented in this project by AxIS team for advices on the experimentation and co-design protocol (through the supervising committee) and various supports to partners related to the dissemination via the Web site, to the workshop animation and Focuslab tools (Sphinx tool, Eye-tracker,) and to the redaction of some deliverables (D2,D3, D3.2 and the final report [61]).

For some pictures of such workshops: http://www.flickr.com/photos/ecofamilies/ ECOFAMILIES Was presented during a report at TV during the 19-20 journal France 3 on October 17. See also a summary of the project ECOFAMILIES on the Web site [69].

6.1.5. *CPER Telius - FocusLab (2008 - 2013)*

Participants: Xavier Augros, Guillaume Pilot, Brigitte Trousse [correspondant].

This grant, funded by Regional and European support, covers 3 areas: an experimental platform for research on telecomnumication networks, a software and informatics platform (including a virtual reality environment, a medical imaging platform, and a peer-to-peer computing grid), and an experimental platform on the usage of information systems. AxIS is being funded through the experimental platform on the usage of information systems called Focus (and renamed FocusLab) (cf. section 5.6).

Projects using elements of the FocusLab platform are reported in [70]. The following list identifies AxIS projects where our platform was used: TIC TAC, ECOFFICES, ECOFAMILIES. In addition to others Inria teams (WIMMICS, REVES), we can cite external organisations/teams: I3M laboratory from university of Nice Sophia Antipolis, CSTB (Sophia Antipolis), the Ergonauts Association, Elliot partners such as BIBA (Germany) and HSR (Italy).

6.1.6. *IMREDD*

Participant: Brigitte Trousse [correspondant].

Our activities on Internet of things (IoT), Environment and Health&Well Being, mainly leaded in the context of the european ELLIOT Project (cf. section 6.3.1.1) are related to "Environment and health", one of the three topics of the Mediterannean Institute of Risks, Environment and Sustainable development (IMREDD [7] in French). This institute is in relation to the EcoCampus of the OIN (*Opération d'intérêt National de la Plaine du var* (University of Nice Sophia Antipolis and Nice Côte d'Azur Metropole).

URL: htmladdnormallinkhttp://unice.fr/universite/imreddhttp://unice.fr/universite/imredd.

6.1.7. *Labex UCN@Sophia*

Participant: Brigitte Trousse.

Title: User-Centered Network

URL: http://www.ucnlab.eu/

Instrument: Labex

Coordinator: University of Nice - Sophia Antipolis

Others partners: I3S (UNS / CNRS), LEAT (UNS / CNRS), Inria, EURECOM

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[7]IMREDD: Institut Méditerranéen des Risques,de l'Environnement et du Développement Durable

Abstract: The Labex UCN@Sophia proposes a research program for researchers of the ICT Campus at Sophia Antipolis, program motivated by a vision which positions the user at the centre of the network. Five scientific and strategic directions are proposed: a) Data Centric Networking, b) Distributed and Ubiquitous Computing, c) Security, privacy and network neutrality, d) Infrastructures: Heterogeneity and Efficiency and e) Energy Efficiency. Two application domains have been selected: e-Health to allow persons with reduced autonomy to retain at home and Intelligent Transport Systems.

AxIS is mainly concerned by Intelligent Transport Systems (mainly by co-creating ITS applications with users and stakeholders) and potentially all the research directions involving users. AxIS experience in ITS domain is based on various projects (c. section 3.2).

6.1.8. ICT Usage Lab

Participants: Brigitte Trousse [correspondant], Bernard Senach.

This year was rich in concrete projects with experiments with citizens or professionals for various members of ICT Usage Lab: CSTB, I3M (UNiversity of Nice Sophia Antipolis) and AxIS (Inria).
The FocusLab platform (CPER Telius 6.1.5) has been avalaible to ICT Usage Lab projects and toother expriments by academics or association of PACA region: EPI Reves (Inria), CSTB, I3M 5university of Nice) and the association Ergonautes.
ICT Usage Lab was partner of the Innovatice City Convention event organised in June 2012 (Nice Côte d'Azur): http://www.innovative-city.fr/partenaires/partners/. In this context we invited two speakers for ICC 2012: Michael Nilsson (CDT, Lulea, Finland) and Khaldoun El Agha (ICT Labs - EIT, Paris).
ICT Usage Lab have several dissemination activities related to ECOFAMILIES, ECOFFICES and ELLIOT projects at the europena level.
ICT Usage Lab was co-founder of the Association France Living Labs (cf. section 6.2.4).
Let us note the visit of Noel Conryut from the living lab for Teaching and Learning (Island of the Reunion) at the end of december in order to identify collaboration topics with our living lab.

6.1.9. Involvement in Regions

PACA Region

- B. Trousse as Inria representative is a member of the expert committee of the PACALABS and of the strategic committee of the PACALABS orientation of the Regional Council.

- 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 and academics disseminating the living lab approach and/or involving them as supporters or partners of experiments. This year, in addition to previous contacts (NCA, CASA, CG06) we had fruitful meetings with PAP (Pôle Azur Provence, a cluster of hinterland territorial communities) to set up collaboration about ecological behaviour changes and with CG06 about eco-tourism. Inside ICT Usage Lab, we had contcats with I3M (University of Sophia Antipolis) involved in the ECOFAMILIES project. See the activities of ICT usage lab (cf. section 6.1.8).

- B. Senach, G. Pilot and B. Trousse had contact with ADEME and CASA in order to promote the real-time traveler information system MOBILTIC which capitalized on the TicTac Project.

- B. Trousse (Inria and ICT Usage Lab representative) was member of the program committee of Innovative City Convention (ICC) 2012 (Nice).

- AxIS as responsible of Elliot experiments has established relations with the Environment department of the urban community of Nice Côte d'Azur (NCA) and CHU Nice in order to organize co-creation workshops.

- B. Trousse gave a talk about ECOFFICES project at the smart grid group (Cap Energies and SCS clusters).
- B. Trousse met in january Stéphane Delalaye from Arsenic association (PACA). Following this contact, we have the opportunity to organise one experiment for HOTEL-REF-PACA in a citizen space at Draguignan (ERIC) and another one for the ELLIOT project in the Hublot (ERIC, Nice).
- AXIS organised two Elliot workshops for professionnels (Health & Environment) in the Environment department of Nice Côte d'Azur (cf. section 6.3.1.1).

Midi Pyrénées Region

- AxIS (C. Detraux and D. L. Scapin) are involved in ANR-PIMI project (cf. section 6.2.1) where the Midi-Pyrénées region and IUT Tarbes are pilot-partners.

6.2. National Initiatives

6.2.1. *ANR PIMI (2010 - 2013)*

Participants: Claudia Detraux, Dominique Scapin [correspondant].

Title: PIMI

Type: ANR

Defi: 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 contributions this year are described in Section 5.4.1.

6.2.2. *FIU FIORA (2012-2015)*

Participants: Yves Lechevallier [correspondant], Thierry Despeyroux.

Program: FIU (14th call)

Project acronym: FIORA

Project title: Moteur d'inférences pour la personnalisation

Duration: 2012-2015

Coordinator: Michel Manago (SME KIOLIS)

Other partners: Editions SOLAR, Mondeca, Inria (AxIS), ISEP, UNiversity of Paris XIII

Abstract: This project aims the design and the development of FIORA an engine offering personnalised content. Perosnnalisation will be based on context parameters related to the user and avalaible semantic information.The main result will be to develop an engine merging case-based reasoning technics, recommandation technics based on collaborative filtering and data mining.The proof concept will be experimented in two domains: a) Nutrition and Health (use of the cohort Nutrinet with more than 200 users) and b) e-tourism.

This project starts at the end of 2012.

6.2.3. Competitivity Clusters

Cap Digital: B. Trousse was reviewer for the selection of proposals for Cap Digital competitively cluster related to the call for Projects "Expérimentation in situ et in vivo de projets" (deadline : September 19th) of Paris Region.

SCS and Cap Energies: B. Trousse was invited for a talk on *Ecoffices: the usages aspect* during a meeeting (April 19th, Brignoles) of the working group Smart grid in PACA (common to two clusters, SCS and Cap Energies clusters).

6.2.4. France Living Labs

The French Network of Living Labs has created the association named "France Living Labs" (F2L) in order to promote the French Living and to facilitate user-driven open innovation on a national level. From the first ENoLL wave in 2006, the French network of living labs has grown from one ENoLL accredited living lab to 47 living labs up to this date after the ENoLL 6th Wave of Call for Membership applications.

The French Network of Living Labs have had annual meetings since 2008. Due the growing number of the French network of living labs, a majority of living labs (25 among 36) has decided to create an association on March 2012 in order to support operations of its members, mainly for common international/European projects, b) to animate the network, promoting the concept of living lab, supporting the sharing of methods and tools and c) to promote the ENoLL label and the Living lab approach by organizing various events and to finally contributing to the maturity of Living Labs European initiative by capitalizing knowledge and experiences and to support the defining KPI indicators for impact assessment of a Living Lab.

ENoLL and France Living Labs are looking into opportunities of closer communication and cooperation in their activities and initiatives through meetings, exchanging of information, knowledge, experiences and best practice. This will be done through signing a formal cooperation agreement (MoU).

B. Trousse (Inria) and A. Zarli (CSTB) are the official representatives of the ICT Usage Living Lab which is a founding member of France Living Labs and member of the administration council. Brigitte Trousse was elected President of the Association in the adminsitration council of april 2012. The association wrote a press communication on June 18.
Three Council Meetings: august (Universcience, Paris), may and october (Inria, Paris).
URL: http://www.france-livinglabs.fr/

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: Experiential Living Lab for the Internet of Things
Type: COOPERATION (ICT)
Defi: Internet of Things and enterprise environments
Instrument: Specific Targeted Research Project (STREP)
Duration: September 2010 - February 2013
Coordinator: TXT Polylemia (Italy)
Others partners:
See also: http://www.elliot-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 conducted the following activities:

- 3 co-conception workshops (1 group of health and/or air professionals) were held in order to identify the ideas and positions of professionals related to potential internet of things services based on air and noise measurements. These workshops took place in Nice during spring 2012; both Aloha! and GenIoT co-creation methods were used and an evaluation of these methods is reported in Section 5.5.2 and [56].

- An experiment with IoT probe (a fake green watch) was run in order to test the online diary and data analysis.

- Specification of the methodology for user experience measurement for Green Services Use case and application for delivrables [50], [63].

- Implementation of MyGreenServices application which collects IoT data from electric cars and citizens sensors and provides some services such as alerts. Usage data are stored in order to be sent to the ELLIOT platform.

- Development of Focuslab V1.3 (cf. section 5.6) in relation to the ELLIOT platform..

- Contribution to a lot of deliverables, five public [47], [46], [55], [50], [63] and three others.

- Co-organisation of two workshops on user experience measurement (KSB model, use cases, data analysis) at Inria Sophia Antipolis and one general meeting dedicated to ELLIOT partners.

6.3.1.2. ICT CSA FIREBALL (2010 - 2012)

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

Title: FIREBALL

Type: CAPACITIES (ICT)

Defi: 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)

URL: 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 Thessaloni, Greece) and Hans Schaffers (Expert at ESoCE Net, Director of Adventure research, Nederlands) for the two scientific publications [26], the white paper [59] and the delivrables D1.2 [58] and D2.1 [60].

This year we finalize a contribution (about 25 pages) on Paca Region - Sophia Antipolis - Nice Côte d'Azur Assets Case Study for a Fireball deliverable [58].

6.3.1.3. SSH CSA IDEAS (2010 - 2012)

      Participants: Yves Lechevallier [correspondant], Marc Csernel, Ehab Assan.

> Title: IDEAS
>
> Instrument: Coordination and Support Action (CSA)
>
> Type: CAPACITIES (SSH)
>
> Duration: January 2010 - June 2012
>
> Coordinator: École française d'Extrême Orient (EFEO)
>
> Others partners: Institute of Ethnology of the University of Turku, Hungarian Academy of Sciences, British Academy, Asien-Afrika-Institut of the University of Hamburg, Istituto italiano per l'Africa e l'Oriente (IsIAO).
>
> Abstract: 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 (ECAF), 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 ECAF members across Asia. The task attributed to Inria was to provide the pilot of a website devoted to the presentation of Asian manuscripts (France)

The contribution of Axis was not only a pilot, as requested within the contract, but also a methodology leading to the construction of a smart search engine dedicated to the pilot. As a prototype website we took the IsIAO website according to our partner's wishes and because it was an opportunity to get together, at the same place, a set of manuscripts and large collection of photographs: the Tucci's collection. The Tucci's collection was a good opportunity to test our methodology and our search engine. The main goal of our search engine is to provide a "reasonable" amount of answers whatever the question is.

The reason of the construction of this search engine was the observation of a lot of orientalist websites, included the most famous one the such IDP (International Dunhuang Project). We find that after a query done by a naive user (one of us) most of the time we obtained either no answer, either a lot too much of them. This was a strong motivation and our pilot tested on the Tucci's collection provide now a "reasonable" amount of answers either according to one of our queries.

6.3.2. Collaborations in European Programs, except FP7

6.3.2.1. COST TwinTide (2010-2013)

      Participant: Dominique Scapin [correspondant].

> Program: COST IC0904
>
> Project acronym: TwinTide
>
> Project title: Towards the Integration of Transectorial IT De- sign 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 De- sign 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.

6.3.2.2. EIT ICT Labs

B. Trousse managed several actions related to EIT ICT Labs:

- Participation at the Living Lab Business Models Coaching and Best-practice Sharing workshop (Telecom italia lab, Turin, April 2-3) organised by the Experience & Living Labs (E&LL) catalyst of the Research component of the european institute EIT ICT Labs http://www.eitictlabs.eu/
- Interaction with Khaldoun El Agha, Valerie Issarny, Olivier Festor and Bruno le Dantec related to the action line called "Digital Cities of the Future" and Proposition of an invited talk at ICC 2012 http://www.innovative-city.fr.
- Participation at the submission at the ICT Labs call (2013) related to E&LL catalyst (which was accepted).

6.4. International Initiatives

6.4.1. Participation in International Programs

6.4.1.1. FACEPE CM2ID, Brazil 2003-2013

Participants: Yves Lechevallier, Marc Csernel.

During 2012 we start a new collaboration on social network data analysis with F.A.T. De Carvalho from Federal University of Pernambuco (Recife) and two Inria Teams AxIS (Inria Rocquencourt) and Orpailleur (Inria Nancy Grand Es -LORIA).

A scientific project **Combining Numerical and Symbolical 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 started on january and will end on 12/2013. Researchers and students are concerned by this project from Orpailleu, AxIS and CIn-UFPE side. It aims at developing Numerical and Symbolical methods of clustering on Multi-valued and Interval Data.

This project aims at developing and comparing clustering algorithms for interval and multi-valued data. Two families of algorithms are studied, namely clustering algorithms based on the use of a similarity or a distance for comparing the objects, and classification algorithms in Formal Concept Analysis (FCA) based on attribute sharing between objects. The objectives here are to combine the facilities of both families of algorithms for improving the potential of each family in dealing with more complex and voluminous datasets, in order to push the complexity barrier farther in the mining of complex data. Biological data, namely gene expression data, are used for test and evaluation of the combination of algorithms. The project involves three teams, one Brazilian team and two French Inria teams, including specialists of clustering and classification methods. Thus the complementarity of the teams is ensured and, in addition, close contacts exist with experts of the domain of data for carrying on a complete evaluation of the results obtained by the combined algorithms expected to be designed during the project.

6.4.2. 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 AxIS (D. L. Scapin)at Inria concern mainly software ergonomics, in the context of AFNOR X35A, X35E, as well as ISO mirror groups:

- National: AFNOR X35A (Ergonomie) (expert); AFNOR X35E (Ergonomie des Logiciels Interactifs), AFNOR groupe de travail "Normes de processus ergonomiques" (chair) [41].
- 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); ISO/TC 159/SC4/WG9 (Tactile and Haptic Interactions) (expert); ISO/TC 159/SC4/WG28 (System and software product Quality Requirements and Evaluation - Common industry Format) (expert); ISO/TC 159/SC1/WG1 (Ergonomic principles) (expert).

6.5. International Research Visitors

6.5.1. Visits of International Scientists

AxIS Rocquencourt welcomed various international scientists from Brazil:

- Francisco de Carvalho (UFPE, Brazil) [17], [34], [27], [23],
- Sergio Queiroz (UFPE, Brazil) [27],
- Cleber Zanchettin (UFPE, Brazil).

B. Trousse visited in October Hicham Behja which is involved in a new position at the National High School of Electrical and Mechanical engineering (ENSEM) at Casablanca in Morocco in October.

6.5.2. Internships

Bruno ALMEIDA PIMENTEL (from Feb 2012 until Jul 2012)

Subject: Social Network Aggregation

Institution: Federal University of Pernambuco (Brazil)

7. Dissemination

7.1. Animation of the Scientific Community

7.1.1. General Audience

- **B. Senach' talk at WUD 2012 [68]:** "Experience is a back hooked lantern that shed light on the travelled path". Current and future research topics are better understood when envisioned within the global framework of societal demands and in relation with historical evolution. For the 2012 World Usability Day event, an overview of the last 40 years research topics in SHS-STIC has been proposed. This presentation showed first how current scientific studies of user experience are linked to a paradigm shift in the 90s' concerning the initially too simplistic relationship between SHS and STIC. From this conceptual crisis emerged in each field (SHS and STIC) specific research tracks and an enlarged model of Human behavior including, among others, social relationships, shared activities, emotions, etc. As expertise in user interface design and evaluation improved in relation with technical development, new societal challenge araised with new methodological requirements.

  First the European community turn towards knowledge economy put stress on open innovation and living lab methodology as a way to accelerate new products and services adoption. Ethno methodology nowadays is more and more used and the field of Service Design has emerged as a domain integrating most of tools and methods previously used for user interface and user experience design.

  In addition, the European Community orientation towards sustainable development brought other requirements concerning deep change of the way of living in occidental society. As it is necessary to adopt eco behavior for resources consumption, mobility and others daily activities, the focus is now on levers helping people to change their behavior. Persuasive interface are a promising research aera. The B. Senach'video presentation at WUD2012 is also available on line on dailymotion.

- **TIC TAC:** co-organisation of the final event (may, large audience) related to the PREDIT Tic Tac at ADEME (Sophia Antipolis) in order to report the results of the project and announce the five citizen, winners of the experiment. Around 40 people participated to this event.

- **ECOFAMILIES:** co-organisation of the final event (large audience) at CSTB (Sophia Antipolis) related to the PACALABS ECOFAMILIES project (cf. section 6.1.4 and the final report [61]. A documentary film has been produced during the project by Natacha Cyrulnik (I3M) and the « Compagnie des Embruns »: this movie offers a testimonial of the participatory design process and shows the families implication all along the project. This project was also the subject of 19-20 journal at France 3 on October 17th. An article on the ECOFAMILIES project - how to promote energy-aware behaviors at home was published on BuildUP and is shared in various social networks (linkedIn, twitter, facebook).An executive summary of the project (english version) was put on the ICT Usage Lab Web site.
- **ECOFFICES:**
  - B. Trousse gave a talk on *Ecoffices: the usages aspect* (April 19th, Brignoles) in the context of the working group Smart grid in PACA (common to two clusters, SCS and Cap Energies clusters).
  - Co-redaction of a flyer (english version) related to the PACALABS ECOFFICES project for the experts of IGSAN during the conferences in Nice distributed by "Chambre de Commerce et industrie" (Enterprise/Environment/Energy Department) ISGAN - CCI.

7.1.2. Editorial Boards and Reviewing

Axis members participate in the **editorial boards** of various journals:

Brigitte Trousse

- Journal of Symbolic Data Analysis
- IJDST - International Journal of Design Sciences & Technology)
- Co-Design Journal

Yves Lechevallier

- MODULAD (electronic journal), http://www.modulad.fr/ as co-editor
- Journal of Symbolic Data Analysis

Dominique Scapin

- BIT (Behaviour & Information Technology) as Associate Editor
- UAIS -International Journal of Universal Access in the Information Society)
- IJHCS - International Journal of Human-Computer Studies
- IWC - Interacting with Computers
- IJPOP - International Journal of People-Oriented Programming
- International Journal On Advances in Intelligent Systems
- JMUI - Journal of Mutimodal User Interfaces
- JIPS - Journal d'Interaction Personne-Système

AxIS members are very regularly **reviewers** for various major journals: ADAC "Advances in Data Analysis and Classification", BIT, ADAC "Advances in Data Analysis and Classification", IJHCS (International Journal of Human-Computer Studies), JMUI (Journal of Multimodal User Interfaces), Le Travail Humain, UAIS, IwC in 2012.

Thierry Despeyroux was reviewer for a book: Advances in Knowledge Discovery and Management Vol. 4 to be published.

D.L. Scapin participated to the content setting and wrote a "Foreword" for the compilation of ergonomic standards by AFNOR: Ergonomie des Logiciels. Recueil de Normes Ergonomie des postes et lieux de travail, AFNOR November 2012.

7.1.3. *Conferences/Workshops Scientific Program Committees*

Y. Lechevallier and B. Trousse are members of the **supervising committee** of the association EGC (http://www.egc.asso.fr/)

Yves Lechevallier was scientific chair of EGC 2012 [39], Bordeaux, France, January 31 - February 3, 2012

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

Brigitte Trousse
- CSCWD 2012, the 2012 16th IEEE International Conference on Computer Supported Cooperative Work in Desig, Wuhan, China , 23-25 may, (sponsored by IEEE SMC Society)
- EGC 2012, Bordeaux, France, January 31 - February 3, 2012
- RàPC 2012, 20th French Workshop on Case-based Reasoning, 25 june, Paris.

Yves Lechevallier
- EGC 2012, Bordeaux, France, January 31 - February 3, 2012

Dominique Scapin
- ACHI 2012, Valencia, Spain, January 30 - February 4, 2012
- ICMI 2012, Santa Monica, California. Oct. 22-26th, 2012
- Workshop "Supportive User Interfaces", Copenhagen, Denmark - June 25, 2012, in conjunction with the EICS 2012 conference
- CENTRIC 2012, Lisbon, Portugal, November 18-23, 2012
- SETIT 2012, Sousse, Tunisia, March 21-24, 2012
- ErgoIHM 2012, Biarritz, France, October 17-19,2012

7.1.4. *Organization of Workshops and Conferences*
- **Yves Lechevallier** was scientific chair of **EGC** 2012, Bordeaux, France, January 31 - February 3 [39].
- **B. Trousse** (as Inria and ICT Usage Lab representative) participated in the *ICC* 2012 program committee in charge of the invited talks. Our two propsoed speakers were selected for the final program (June 7th): Michael Nilsson coordinator of the FIreball project (CDT, Luleå University of Technology) and Khaldoun El Agha (University Paris 8 and ICT labs).

7.1.5. *Participation in PhD Thesis Committees*

AxIS researchers were members of the following Ph.D. committees in 2012:
- **Julie Seguela**, Ph.D.: Fouille de données textuelles et systèmes de recommandation appliqués aux offres d'emploi diffusées sur le web. CNAM, école doctorale EDITE, May 3, 2012: Y. Lechevallier (Examinateur).
- **Jean-Baptiste Masson**, Ph.D.: SIGFRIED 2 : Modèles de mélange censurés et autres méthodes statistiques pour la construction d'indicateurs spatialisables de la qualité de l'air intérieur dans les logements français. Université de Technologie de Compiègne, May 30, 2012: Y. Lechevallier (Rapporteur).
- **Annette Casagrande**, Ph.D.: Proposition d'une mesure de voisinage entre textes: Application à la veille stratégique. Université de Grenoble, école doctorale MSTII, July 3, 2012: Y. Lechevallier (Examinateur).
- **Thomas Villaren**, Ph.D.: « Modèles et mécanismes d'adaptation d'Interaction Homme-Machine aux changements de contexte », Université de Bretagne, Département : Logique des Usages, Sciences Sociales et de l'Information (LUSSI), spécialité « STIC », November 30, 2012: D. L. Scapin (Rapporteur).
- **Jacques-Henri Sublemontier** , Ph.D.: Classification non supervisée : de la multiplicité des données à la multiplicité des analyses. Université d'Orléans, December 7, 2012: Y. Lechevallier (Rapporteur).
- **Djamal Adboul Nasser Seck**, Ph.D.: Arbres de décision symboliques, outils de validation et d'aide à l'interprétation. Université Paris-IX Dauphine, December 20, 2012: Y. Lechevallier (Rapporteur).

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. 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. Course on "Méthodes neuronales" (12h).

> *Ecole Nationale des Sciences Géographiques* (ENSG): Course on Clustering (12h).

7.2.2. *PhD Thesis Supervision*

AxIS is an associated team of the STIC Doctoral school of 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.

B. Trousse is involved in the supervision committee of E.L. Moukhtar Zemmouri, PhD student in Morocco.

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