RESEARCH CENTER

FIELD

Activity Report 2013

Section Contracts and Grants with Industry

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ABS Project-Team (section vide)

ABSTRACTION Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. License agreement

7.1.1.1. Astrée

In February 2009 was signed an exploitation license agreement between CNRS, École Normale Supérieure, and AbsInt Angewandte Informatik GmbH for the industrialization of the ASTRÉE analyzer. ASTRÉE is commercially available from AbsInt since January 2010. Continuous work goes on to adapt the ASTRÉE static analyzer to industrial needs, in particular for the automotive industry. Radhia Cousot is the scientific contact.

ACES Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. Energy saving mechanisms in smart homes using ambient computing principles

- Partner : EDF - R&D
- Starting: 01/06/2010, ending : 01/10/2013

This project is funded by EDF group, leading energy producer in Europe. It started in June 2010 and ended in October 2013. Its goal is to study the use of ambient computing principles for the management of electricity consumption in residential habitat. It focusses on two main objectives: (1) to define scenarios based on home people activities, and (2) to propose an implementation of these scenarios using ambient computing mechanisms studied in the Aces project.

Most existing smart home solutions were designed with a technology-driven approach. That is, the designers explored which services, functionalities, actions and controls could be performed exploiting available technologies. This led to solutions for human activity recognition relying on wearable sensors, microphones or video cameras. Those technologies may be difficult to deploy and get accepted in real-world households, because of convenience and privacy concerns. Many people have concerns on carrying equipments or feeling observed or recorded while living their private life. This could seriously impact the acceptability of the smart home system or reduce its diffusion in real households. To avoid such kind of issues, we designed our system with an acceptability-driven approach. That is, we selected technologies that respond to the constraints of a real-world deployment of the future smart home system, namely, convenience and privacy concerns. We decided to take a very conservative approach, choosing technologies that are as unobtrusive as possible, in order to explore the frontiers of what can be done in a smart home with a very limited instrumentation. Following the same considerations, the adopted technologies and techniques had to guarantee a fast and easy configuration, ultimately allowing a plug-and-play deployment. All these aspects have been studied and experimented using a hardware/software platform maintained by Sylvain Roche. This platform integrated results of two PhDs defended in 2013 (Michele Dominici and Bastien Pietropaoli), and has been used for a demonstration in June 2013 at EDF. A part of software developments is now published under apache licence (see 4.1.1) and used by the team.

The new results in 2013 are presented in section 5.2 .

ADAM Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. France Telecom

Participants: Rémi Druilhe, Laurence Duchien [correspondant], Romain Rouvoy, Lionel Seinturier, Amal Tahri.

DigiHome is a contract with France Telecom to study the adaptation of software systems in distributed digital home environments. These environments and their extensions (vehicles, holiday homes, work at home) are now invaded by a multitude of communicating objects dedicated to content management, viewing multiple video streams, or information sharing within a community network. These objects offer services with capacities of configuration and remote administration, and advanced interactions with the end-user or between devices or services. Given the lack of universality of proposals from IT and device companies and the lack of interoperability of these devices and services, it becomes necessary to offer a virtual environment named Extended Digital Home to encompass and unify these proposals and make life easier for the inhabitants. First, we will propose a unified model for integrating devices and services inside and outside the home with a continuum between private and public lives. Second, we will study an energy model to save energy in this extended environment. Overall, the goal of this project will be to propose to design a model for a cloud inside home and to provide some means to reduce the energy using on media devices. First results have been published in [73] and [63]. This contract is complemented by two contracts, which are the CIFRE contract associated to Rémi Druilhe PhD thesis [11] and the CIFRE contract associated to Amal Tahri PhD thesis.

7.2. Kaliterre

Participants: Aurélien Bourdon, Romain Rouvoy [correspondant].

Web Energy Archive (WEA) is a project funded by the French Environment and Energy Management Agency (ADEME) to archive the energy consumption of Web sites that are accessible on the Internet. The objective of this project is to constitute an international referential on the evolution of the Web energy consumption. The adopted methodology focuses on the quality of experience and measures the energy consumed by users when they browse a specific website. The benefit of this approach is that it is representative of Internet usages and takes into account the variety of Web browsers and computer architectures. The software solution developed by this project will build on the HTTP Archive project, initiated by Google, and will extend it with consumption measures that will be collected by our PowerAPI library. The objective of this collaboration is to port our solution to the Windows operating system.

7.3. ip-label

Participants: Nicolas Haderer, Christophe Ribeiro, Romain Rouvoy [correspondant].

This collaboration aims at transferring APISENSE® in the industry by investigating the deployment of this platform as a solution to monitor the quality of the GSM signal in the wild. The objective is to provide developers and stakeholders with a feedback on the quality of experience of 3G connection depending on their location.

7.4. dooApp

Participant: Martin Monperrus [correspondant].

The collaboration with dooApp aims at studying a bi-directional automated link between the specifications and standards they work with (from AFNOR, ISO) and their code base in order to facilitate and automate software evolutions.

ALEA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Contract with Astrium/EADS. The aim of this contract, in collaboration with the EPI AYIN, is to develop automatic object tracking algorithms on a sequence of images taken from a geostationary satellite. P. Del Moral cosupervises with J. Zerubia the PhD thesis of Paula Craciun on this subject.

Contract with CNES

The goal of this contract is to predict the trajectories of space debris around the earth. It is necessary to provide a new methodology since traditional methods such as Kalman filtering do not work satisfactory.

7.2. Bilateral Grants with Industry

- EDF (phd F. Proia)

ALF Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Intel Research Grant

Participant: André Seznec.

Intel is supporting the research of the ALF project-team on "Alternative ways for improving uniprocessor performance".

ALGORILLE Project-Team (section vide)

ALICE Project-Team (section vide)

ALPAGE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts with Industry

Alpage has developed several collaborations with industrial partners. Apart from grants described in the next section, specific collaboration agreements have been set up with the following companies:

- Verbatim Analysis (license agreement, transfer agreement, “CIFRE” PhD, see section 4.3),
- Lingua et Machina (DTI-funded engineer, see section 4.4), Viavoo,
- Yseop (“CIFRE” PhD of Raphael Salmon which started in 2012 on automatic text generation)
- CEA-List (“CIFRE” PhD of Quentin Pradet on the development of lexical resources which help annotating semantic roles; e.g., development of a French VerbNet)

ALPINES Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

BPI France (ex OSEO) supports our work on superresolution methods in acoustics. It enabled us to establish a collaboration with Laboratoire d'Acoustique du Mans (LAUM).

AMIB Project-Team (section vide)

ANGE Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

The team is engaged in two industrial contracts:

- **La compagnie du vent (subsidiary of GDF-Suez)** The team is intented to provide simulations of hydrodynamics in salt marshes This contract is shared with the BIOCORE Inria project-team and comes to 20.000 euros.
- **SAUR** Discussions have been engaged in 2013 and might lead to a research contract in 2014. This project would rely on the optimization of hydrodynamics in a lagoon in order to depollute it.

7.2. Bilateral Grants with Industry

The PhD thesis of P. Ung is financed by CNRS, by AMIES (French agency for mathematics in interaction with companies and the society) and by GeoHyd (now a part of ANTEA–group) whose mission is the management of integrated natural resources. The PhD comprises simulations of concrete cases by means of the EDF software Telemac.

AOSTE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Kalray MPPA256 experiments

As part of a larger collaborative programme between Inria and this company, new experimental machines equipped with Kalray MPPA256 manycore processor were provided to a small number of Inria teams. The processor itself consists of 16 processing clusters, each itself a 16-core processor (hence 256 cores altogether), The clusters are connected by an on-chip network, and the whole architecture (driven by a host, out-of-chip main CPU) may be programmed according to several computation models, some quite close from the MoCCs considered in our researches.
Part of this 10-month contract was meant to fund two internships, in our case on:

- The evaluation of performance (and most of all performance variability) of the various parts of the chip (in the Sophia Antipolis branch of the team). Results are discussed in section 6.5 .
- The evaluation of the possibility of code generation for the MPPA256 platform using the Lopht tool described in sections 5.4 ,6.6 .

7.1.2. Astrium/CNES PostDoc

Astrium Space Transportation (now part of Airbus Defence and Space) asked us if we could provide automatic methods for the design and implementation of embedded software and system/network configuration in an aerospace context. The objective is to reduce the design and validation costs (especially in case of system evolutions), while preserving an assurance level superior to that of the Ariane 5 flight program. We are exploring automation of the real-time allocation, scheduling, and code generation using the novel algorithms developed and implemented in the Lopht tool.
The post-doctoral position of Raul Gorcitz was funded on this contract.

7.1.3. Kontron CIFRE

This contract provides us means to partially support the PhD thesis of Mohamed Bergach (which is physically most of the time at Kontron Toulon). The topic is to study how to efficiently implement various sizes of the FFT (Fast Fourier Transform) algorithm on multicore and GP-GPU architectures from the range of processors used at Kontron, in order to understand in a second phase how to best allocate several such algorithms in parallel, as part of a single application, in the most efficient way (regarding performance but also power consumption and thermal constraints).

APICS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contract CNES-Inria-XLIM

Contract (reference Inria: 7066, CNES: 127 197/00) involving CNES, XLIM and Inria, focuses on the development of synthesis procedures for N-ports microwave devices. The objective is here to derive analytical procedures for the design of multiplexers and routers as opposed to the classical "black box optimization" which is usually employed in this field (for $N \geq 3$). Emphasis at the moment bears on so-called “star-topologies”.

7.2. Contract CNES-Inria-UPV/EHU

Contract (reference CNES: RS10/TG-0001-019) involving CNES, University of Bilbao (UPV/EHU) and Inria whose objective is to set up a methodology for testing the stability of amplifying devices. The work at Inria concerns the design of frequency optimization techniques to identify the linearized response and analyze the linear periodic components.

ARAMIS Team

7. Bilateral Contracts and Grants with Industry

7.1. Patents

Participants: Thomas Similowski [Inventor], Mathieux Raux [Inventor], Pierre Pouget [Inventor], Jacques Martinerie [Inventor], Mario Chavez [Inventor].

Patent title: Procédé de caractérisation de l'état physiologique d'un patient à partir de l'analyse de son activité électrique cérébrale, et dispositif de surveillance faisant application

Publication date: 07.11.2013

Publication number: WO 2013/164462 Al

Abstract: The invention relates to a method for detecting a physiological state of a patient deviating from a reference physiological state, in which, after having determined, in Q frequency band, R reference matrices which correspond to the reference physiological state, the following steps are repeated in a loop: carrying out measurements, in M time segments, of an electroencephalographic signal; filtering and centring the measurements in Q frequency bands to obtain and determine MxQ scaled matrices of spatial covariance; for each time segment m, calculating a deviation from the reference physiological state, and comparing each of the deviations from the reference physiological state to a predefined threshold. The invention also relates to a monitoring device.

ARIC Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Contract with STMicroelectronics

A contract between STMicroelectronics and Inria supported our work on floating-point arithmetic code generation and specialization for embedded processors (duration: 36 months; amount: 36,000 euros; signature: fall 2010). This work, which was done jointly with the Compilation Expertise Center of STMicroelectronics Grenoble, was also supported by the PhD CIFRE grant of Jingyan Jourdan-Lu.

7.1.2. Collaboration with Bosch

Bosch (Stuttgart) ordered us a study on the choice of an adequate representation of numbers (fixed-point or floating-point) for some embedded systems. The study was conducted by Florent de Dinechin and Jean-Michel Muller.

7.1.3. Collaboration with Intel

INTEL made a $20000 donation in recognition of our work on the correct rounding of functions.

7.2. Bilateral Grants with Industry

7.2.1. Kalray CIFRE PhD Grant

Nicolas Brunie is supported by a CIFRE PhD grant (from 15/04/2011 to 14/04/2014) from Kalray. The purpose is the study of a tightly coupled reconfigurable accelerator to be embedded in the Kalray multicore processor. Advisors: Florent de Dinechin and, within Kalray, Benoît de Dinechin. The support contract between Kalray and Inria amounts to 76,000 euros on three years.

7.2.2. Orange Labs PhD Grant

Marie Paindavoine is supported by an Orange Labs PhD Grant (from October 2013 to November 2016). She will work on privacy-preserving encryption mechanisms.

ARLES Project-Team (section vide)

ASAP Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Technicolor

Participants: Fabien André, Anne-Marie Kermarrec.

We have a contract with Technicolor for collaboration on large-scale infrastructure for recommendation systems . In this context, Anne-Marie Kermarrec is the PhD advisor of Fabien André since November 2013. Fabien André will work on efficient algorithms for heterogeneous data on large-scale platforms.

7.2. Orange Labs

Participants: Ali Gouta, Anne-Marie Kermarrec.

We have had a contract with Orange Labs for collaboration on peer-assisted approaches for caching and recommendation in streaming applications. In this context, Anne-Marie Kermarrec has been the PhD advisor of Ali Gouta since 2012.

7.3. Web Alter-Egos Google Focused Award

Participants: George Giakkoupis, Anne-Marie Kermarrec, Nupur Mittal, Javier Olivares.

Duration: Sep. 2013 - Sep. 2015; Coordinator: Inria and EPFL.

This project addresses the problem of extracting the alter-egos of a Web user, namely profiles of like-minded users who share similar interests, across various Internet applications, in real time and in the presence of high dynamics. Beyond their intrinsic social interest, the profiles of alter-egos of a user are crucial to identify a personalized slice of the Internet that can be leveraged to personalize the Web navigation of that user. The expected outcome of the project is a generic architecture of a Web-Alter-Ego service that can run on various devices and use, as well as be used for, various Web applications.

ASCLEPIOS Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Inria - Mauna Kea Technologies I-Lab SIWA

6.1.1. Inria - Mauna Kea Technologies I-Lab SIWA

Participants: Nicholas Ayache [Correspondant], Xavier Pennec, Irina Vidal-Migallón, Marzieh Kohandani Tafreshi, Julien Dauguet, Tom Vercauteren, Barbara André.

GPU, registration, OpenCL

The I-Lab SIWA (Stitching Images and Wisdom into the Atlas) aims at maturating two key image processing technologies into real products for confocal fibered-microscopy. The first axis on content-based image retrieval (CBIR) will develop efficient and friendly tools for helping diagnosis and for user training. The second axis on image registration will develop near real-time and robust image registration tools for mosaicking, image stabilization and super-resolution. Both goals are built on GPU implementations of widely used algorithms (e.g. [33]).

For more information, see here.

6.2. CIFRE PhD Fellowships

6.2.1. General Electric

The work of Thomas Benseghir, *3D/2D Coronary Registration for Interventional Cardiology Guidance*, is supported by a PhD fellowship from the General Electric company.

6.3. Other contracts

The contracts Cancéropôle PACA, Philips, and Siemens are described in our previous activity reports.

6.4. Creation of spin-off company Therapixel

Therapixel is a spin-off of the Asclepios (Inria Sophia Antipolis) and Parietal (Inria Saclay) project teams. It was founded in June 2013 by a team of 11 partners and the IT-Translation investment fund. Therapixel makes information systems for image guided therapy designed for operating theaters: interventional radiology or surgery. It relies on depth sensing, advanced software processing and innovative user interfaces to provide touchless control of the computer. This technology allows for a direct control of the computer that sterility constraints made impractical in the past. It also opens up new opportunities for image guided surgery and allows for more integration in the management of digital information before, during and after intervention.

Two prototypes are undergoing testing for 18 months at the Centre Antoine Lacassagne (interventional radiology) and the University Hospital of Nice (neurosurgery). The development started in 2011 as a specialisation of the MedInria software. From early 2012, a dedicated team composed of 2 researchers and 3 engineers worked on the project. Therapixel received 2 awards at the OSEO national contest for the creation of start-up companies.

6.5. National initiatives

6.5.1. Consulting for Industry

Nicholas Ayache is scientific consultant for the company Mauna Kea Technologies (Paris).

6.5.2. Collaboration with national hospitals

Asclepios is collaborating with the following 3 IHU (University Hospital Institute) in France : the IHU-Strasburg (Pr J. Marescaux and L. Soler) on image-guided surgery, the IHU-Bordeaux (Pr M. Haïssaguere and Pr P. Jaïs) on cardiac imaging and modeling and the IHU-Pitié Salpétriére (Dr. O. Colliot and S. Durrleman) on neuroimaging.

We also have long term collaborations with the CHU Nice and Centre Antoine Lacassagne in Nice.

Asclepios is part of the EQUIPEX MUSIC with Bordeaux University Hospital in order to build an XMR interventional room equipped with a medInria workstation.

ASCOLA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Cooperation with SIGMA group

Participants: Thomas Ledoux, Simon Dupont.

In 2012, we have started a two-fold cooperation with Sigma Group (http://www.sigma.fr), a software editor and consulting enterprise. The cooperation consists in a joint (a so-called Cifre) PhD on eco-elasticity of software for the Cloud and the sponsorship of several engineering students at the MSc-level.

As a direct consequence of the increasing popularity of cloud computing solutions, data centers are amazingly growing and hence have to urgently face with the energy consumption issue. The aim of Simon Dupont's PhD, started in November 2012, is to explore the *software elasticity* capability in Software-as-a-Service (SaaS) development to promote the management of SaaS applications that are more flexible, more reactive to environment changes and therefore self-adaptive for a wider range of contexts. As a result, SaaS applications become more elastic and by transitivity more susceptible to energy constraints and optimization issues. In 2013, we presented our first results at ECOCITY, the World Summit on sustainable cities (http://www.ecocity-2013.com/en) and at NEM Summit (http://nem-summit.eu).

ASPI Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral contracts with industry

6.1.1. DUCATI: Optimization of sensors location and activation — contract with DGA / Techniques navales

Participant: François Le Gland.

See 3.3 and 4.2

Inria contract ALLOC 7326 — April 2013 to December 2016.

This is a collaboration with Christian Musso (ONERA, Palaiseau) and with Sébastien Paris (LSIS, université du Sud Toulon Var), related with the supervision of the PhD thesis of Yannick Kenne.

The objective of this project is to optimize the position and activation times of a few sensors deployed by one or several platforms over a search zone, so as to maximize the probability of detecting a moving target. The difficulty here is that the target can detect an activated sensor before it is detected itself, and it can then modify its own trajectory to escape from the sensor. This makes the optimization problem a spatio–temporal problem. The activity in the beginning of this project has been to study different ways to merge two different solutions to the optimization problem : a fast, though suboptimal, solution developped by ONERA in which sensors are deployed where and when the probability of presence of a target is high enough, and the optimal population–based solution developped by LSIS and Inria in a previous contract (Inria contract ALLOC 4233) with DGA / Techniques navales.

ATEAMS Project-Team (section vide)

ATHENA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Patent

Participants: Maureen Clerc, Thomas Brochier, Romain Trachel.

A French patent (number 13 60563) was filed on 29 october 2013. It describes a Brain Computer Interface to enhance human performance in visuo-spatial attention tasks.

7.2. CIFRE PhD contract with Neurelec

Participants: Maureen Clerc, Kai Dang, Théodore Papadopoulo, Jonathan Laudanski [Neurelec].

Title: Modeling and characterizing electrical conductivity for the placement of cochlear implants.
Neurostimulation consists in applying an electrical current close to a nerve to trigger its activation. This is the principle of cochlear implants, which aim to stimulate the auditory nerve via an electrode coil inserted in the cochlea. The interplay between the stimulating electrodes and the bioelectrical medium is modeled by a partial differential equation whose main parameters are the electrical conductivity and geometry of the tissues. This equation also links active sources and electric potential measurements by electroencephalography. The objective of this PhD thesis is to propose models for efficiently representing tissues and their electrical conductivity within the auditory system (bone, cochlea, ganglia, auditory cortex). This will make it possible to optimize the stimulating current, thanks to a better knowledge of the current diffusion due to the anatomical conformation of the cochlea.

7.3. PACA PhD contract with Olea Medical

Participants: Marco Pizzolato, Rachid Deriche.

Title: Diffusion & Perfusion MRI : From bench to bedside
The objectives of this PhD thesis are to develop innovative techniques in diffusion and perfusion MRI in close collaboration with OLEA MEDICAL. A certain number of important issues related to dMRI and pMRI signal processing and modeling have been identified by ATHENA and OLEA MEDICAL. These technical issues will be tackled within the framework of this PhD thesis fully granted by the Region PACA and by OLEA MEDICAL.

7.4. dMRI@Olea-Medical

Participants: Aurobrata Ghosh, Théodore Papadopoulo, Rachid Deriche.

The ongoing collaboration with OLEA MEDICAL has allowed us to form a crucial link between academic research at ATHENA and the medical imaging industry, via OLEA MEDICAL. Since Auro's recruitment in May and following a planned road-map, we have been developing a generic and templated C++ core library comprised of the expert algorithms researched at ATHENA in the domain of diffusion MRI. This library and its functionalities are being integrated into OLEA MEDICAL's flagship product Olea Sphere. So far the following non-exhaustive list of estimation modules have been implemented – DTI (least squares (LS), weighted least squares (WLS) & Cholesky, which provides positivity constraint); Generalized DTI using tensors of order 4 (LS, WLS & Ternary Quartics (TQ) which provides positivity constraint) and DKI (LS, WLS, Cholesky + TQ for positivity). Further a number of biomarkers or scalar strains for each of these models have also been implemented, such as FA, MD, VR, RA, MK, etc. The external tools used consist of well known standard libraries and softwares such as C++ STL, LAPACK, NLOpt, CMake, Git, etc. Finally an externally callable C-interface is provided to wrap the core C++ library, which makes it useable from C++ and C programs.

The next milestones on the road-map includes higher order models such as ODFs, FODs, EAPs, etc. This will be followed up by tractography algorithms – both deterministic and probabilistic.

ATLANMOD Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. WebRatio

AtlanMod has helped WebRatio and the University of Trento in the definition (to be provided as an answer to the corresponding OMG RFP) of IFML, a modeling language for designing user interaction flows (not limited to the Web). Such a language should be: Extremely compact (no useless overhead), Effective (allows to model exactly what users want), Efficient (grants high reusability of model fragments), Easy to learn (very low learning curve), Comprehensive (covers most of the user interaction needs), Open and extensible (for covering any ad-hoc logic) and Platform independent (addressing any type of user interface device).

For more information about IFML - Interaction Flow Modeling Language see [7].

7.1.2. IBM

IBM is funding a PhD Thesis on the topic of reverse engineering of business rules from COBOL systems (see the new results section for more details).

[7] http://www.ifml.org/

AVALON Team (section vide)

AVIZ Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Google Research Award

Participants: Jean-Daniel Fekete [correspondant], Petra Isenberg, Jeremy Boy, Heidi Lam.

Offering data access to the public is a strong trend of the recent years. Several free data providers or repositories are now online (e.g. http://data.gov.uk, http://stats.oecd.org, http://publicdata.eu, http://opendata.paris.fr, http://www.google.com/publicdata, http://www.data-publica.com), offering a rich set of data to allow citizens to build their own understanding of complex political and economic information by exploring information in its original form. However, these initiatives have had little impact directly on the public since working with this open data is often cumbersome, requires additional data wrangling, and the spreadsheets themselves take a long time to understand before useful further work can be done with them. This proposal focuses on public data visualization to offer more engaging environments for exploration of public data and to enable stronger democratic discourse about the data contents.

The goal of this proposed research project is to bridge the gap between generic visualization sites for public data and engaging content-specific visualization of this data which can be used and individually adapted to tell a story about public data. Through the design and deployment of rich and engaging interactive visualizations from public data sources we want to truly reach the goal of the public data movement: empowering the citizens and social actors by allowing them to better understand the world they are living in, to make informed decisions on complex issues such as the impact of a medical treatment on a dangerous illness or the tradeoffs offered of power plant technologies based on facts instead of assumptions.

For more information, see http://peopleviz.gforge.inria.fr/trunk.

AXIS Project-Team (section vide)

AYIN Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts and Grants with Industry

7.1.1. EADS foundation Paris

Participants: Ikhlef Bechar, Josiane Zerubia [PI].

Detection of objects in infrared imagery using phase field higher-order active contours. In collaboration with Ian Jermyn from the University of Durham (Dept of Mathematical Sciences). This contract finished at the end of March 2013. Contract #4643.

7.1.2. ASTRIUM EADS Toulouse

Participants: Paula Craciun, Josiane Zerubia [PI].

Automatic object tracking on a sequence of images taken from a geostationary satellite. Contract #7363.

7.1.3. CNES Toulouse

Participants: Ihsen Hedhli, Josiane Zerubia [PI].

Multi-sensor change detection. Application to risk management after the Haiti earthquake. Contract #8361.

7.1.4. CNES Toulouse

Participants: Aurélie Boisbunon, Josiane Zerubia [PI].

Parameter estimation for automatic object change detection in a sequence of very high resolution optical images.

BACCHUS Team (section vide)

BAMBOO Project-Team (section vide)

BANG Project-Team (section vide)

BEAGLE Project-Team (section vide)

BIGS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Start-up project by T. Bastogne:

- Industrial partner: Cybernano (Contract Research Organization in NanoMedicine).
- Status: SAS created in July 2013.
- Comments: Cybernano has received the "emergence" award in 2012 from the French Research ministry for the creation of start-up based on innovative technology. Cybernano proposes innovating services to reduce the cost and control the risk during the preclinical development of nanoparticles in oncology applications. The engineering approach used by this spin-off is strongly based on the use of suited mathematical models. Concerning the BIGS program for the next four years, Cybernano is particularly interested by two items: (i) Development of a Matlab toolbox for cost-effectiveness analysis in clinical studies. (ii) Development of algorithms for treatment planning systems associated with nano-therapies.

BIOCORE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

La compagnie du vent: the objective of the contract is to predict the impact of large scale raceway design on microalgal productivity using our Inalgae software platform.

BioEnTech: the contract with the BioEnTech start-up is aiming at developing new functionalities for ODIN in order to improve the advanced monitoring and control of industrial anaerobic digesters

Enea Consulting: the contract is dealing with the estimation of the potential overall microalgae production in France, using the light-temperature models that we have developped.

BIPOP Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Schneider Electric: thèse de Narendra Akadkhar.
- Ansys France: thèse de Mounia Haddouni.
- Aldebaran: thèse de Jory Lafaye.
- Adept Technology: thèse de Saed al Homsi.

7.1.1. L'OREAL - contrat d'étude 2012-2013

Participant: Florence Bertails-Descoubes.

Contrat d'étude with L'Oréal, from in December 2012 until April 2013. The topic was the automatic generation of the geometry of a hair wisp given some statistical properties such as density or curliness distribution.

7.1.2. AGT Digital - contrat de collaboration de recherche et de transfert 2013

Participants: Florence Bertails-Descoubes, Gilles Daviet.

Contrat de collaboration de recherche et de transfert with AGT Digital, from January 2013 until August 2013. AGT-Digital is a French start-up localized in Paris and specialized in the production of virtual hair models for the entertainment industry as well as for virtual hairstyling applications. The goal of this project was to transfer our work on the simulation of fiber assemblies suject to frictional contact [8] as well as to develop new features in line with the production pipeline under the Maya software. Gilles Daviet was hired on this project during 6 months as an Inria engineer to perform these software developments.

7.1.3. L'OREAL - contrat de collaboration de recherche et de transfert 2013-2014

Participants: Florence Bertails-Descoubes, Alexandre Derouet-Jourdan.

Contrat de collaboration de recherche et de transfert with L'Oréal, from October 2013 until April 2014. The goal was to transfer software corresponding to our recent work on the inversion of isolated fibers under gravity [54],[28] (especially the APPROCHE source code) while ensuring compatibility between different software.

BONSAI Project-Team (section vide)

CAD Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. Geometry

We contributed to some industrial applications, mainly:

- Aircraft industry: Design of winglets (with EADS)

  In this project, our aim was to improve the geometric preprocessing of the CAD models generation that were used for the manufacturing of the multi parted wing-fuselage configuration and the generation of the numerical grids for the corresponding numerical simulations. We try developing algorithms for automatic generation of winglets with different bending radii, angles and top views. Some of the methods for approximation, fairing, modeling and grid generation used for this task are in principle well known in literature. However, standard commercial CAD systems cannot be used for the modeling of the surfaces because they do not provide the interfaces to fulfill the special constraints, which stem from the design wishes and the manufacturing and the needs of the applied flow solver for the aerodynamics equations.

- NC Simulation (with Spring Technologies)

  The aim of this work was to rebuild a CAD file (Brep, STEP format) from the result of a machining simulation (set of triangles). Any CAM software would use this reverse engineered model for any further application (inspection / FEM / definition of further tool paths). Another expected application was to rebuild CAD files from old G -code programs for which the initial CAD files do not exist anymore (or had never been modeled in 3D). Spring NCSimul provides a set of triangles as a solid. This set is topologically closed and represents a single solid. All data could be used to help gather triangles by geometric entities and then to help compute the exact surfaces. Different types of machining operations have been considered: Machining of simple shapes: The movement of the tool generates the same kind of surfaces as the tool ones: planes, cylinders, torus, etc. and Machining of complex shapes: the tool moves on a surface (canonic surface as well as NURBS surface) along a point-to-point path. Here, the reverse engineering is far from straightforward and the surface recognition would be computed at a tolerance.

- Dam Construction (with CHIDI / Dassault System)

  Once the digital terrain modeling and the geological shapes are represented, dam design issue is one of the most important difficult applications for geological modeling. This issue considers a multiple geometric representation of geological and design features. The dam design is based on NURBS surfaces representation and parametric design is an important key point when modifying shape or geometrical parameters and properties. In the other hand, geological shapes are mesh-based (surface meshes for geometrical characteristics, and volume meshes for material and engineering properties). In the plant interaction, we have impact the dam basement on the geological modeling. That is to say, remove a solid to a mesh. Then map geological properties to the solid. At this time, there was no feasible well-designed NURBS-Mesh Boolean operation algorithm in both research and industrial field and the aim of our work was to develop a stable NURBS-Mesh Boolean operation algorithm. This long-term work was developed for the CHIDI Company (Chengdu) with the participation of Dassault System. Moreover, in order to provide simulations after the Earthquake in Sichuan, we first focused our work on the Boolean operation algorithms.

6.1.2. Computer Graphics

6.1.2.1. Image resizing (with Shanghai Film Studio)

We have developed an image resizing method that succeed in generating impressive results by using image similarity measure to guide the resizing process. An optimal operation path is found in the resizing space.

However, the slow resizing speed caused by inefficient computation strategy of the bidirectional patch matching becomes a drawback for practical use. Then, we proposed a novel method to address this problem. By combining seam carving with scaling and cropping, our method can realize content-aware image resizing very fast. We define cost functions combing image energy and dominant color descriptor for all the operators to evaluate the damage to both local image content and global visual effect. Therefore our algorithm can automatically find an optimal sequence of operations to resize the image by dynamic programming or greedy algorithm. We also extended our algorithm to indirect image resizing which can protect the aspect ratio of the dominant object in an image.

CAGIRE Team (section vide)

CAIRN Project-Team (section vide)

CALVI Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

CLAC is a joint project with a Strasbourg small company, AxesSim, which develops software for electromagnetic simulations. Thomas Strub, who is employed in AxesSim with a CIFRE position, is doing his PhD on the design and development of CLAC applied to electromagnetic problems.

CAMUS Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

A contract with the French company Kalray (http://www.kalray.eu) was established early 2013. It provided to the team the Kalray 256-core MPPA platform and necessary funding to recruit a student for a 6-months internship: Dhruva Tirumala Bukkapatnam. A deep evaluation of the platform regarding performance and programming strategies has been accomplished. Moreover, an extension of the source-to-source compiler Pluto (http://pluto-compiler.sourceforge.net), allowing to automatically generate code adapted for the MPPA has been mostly implemented.

CARAMEL Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Training and Consulting with HTCS

Participants: Pierrick Gaudry, Emmanuel Thomé [contact].

The training and consulting activities begun in 2012 with the HTCS company have been pursued, and the existing contract has been renewed in identical form for 2013 and 2014.

7.2. Study of the Kalray MPPA-256 Processor for Applications in Cryptology

Participants: Jérémie Detrey, Pierrick Gaudry [contact].

A 5-month contract has been signed between CARAMEL (through Inria) and Kalray, a French company which has recently designed and manufactured the MPPA-256 processor, a 256-core VLIW architecture targeted at embedded applications. The objective of this contract was to study the performance of this processor in a cryptographic context. Several key arithmetic primitives, such as multi-precision modular arithmetic or polynomial multiplication in binary and ternary fields, were implemented and optimized to take advantage of the specific micro-architecture and instruction set of the VLIW cores of the MPPA-256. The results are encouraging and prompt us to explore further the possible benefits of this processor for cryptanalytic applications.

7.3. Study of the electronic voting system of Voxaly

Participants: Pierrick Gaudry, Stéphane Glondu [contact].

A 4-month contract has been signed between CARAMEL, CASSIS and Voxaly, a French company who is proposing solutions for the organization of on-line elections. During several meetings, we discussed their current solution and proposed improvements to gradually add security features that get close to the academic standards.

CARMEN Team

7. Bilateral Contracts and Grants with Industry

7.1. Contract Medic Activ between Inria and Interaction Healthcare (Groupe Interaction)

The contract between Interaction Healthcare and Inria was signed on April, 13th, 2013.

Aiming to develop a numerical platform for simulation in medicine called « Medic Activ », the society Interaction Healthcare requested the help of the team Carmen, within a call for project entitled « serious games » from the Région Aquitaine.

The team Carmen will provide its expertise in numerical simulation of cardiac electrophysiology and the ECG (ElectroCardioGram), based on realistic human datasets. The society Interaction Healthcare is specialized in the design and creation of digital services and e-health. The complementarity between both partners is mandatory for the project to start on a coherent scientific basis.

The human resources engaged on the Inria side includes a engineer deveoted to the transfert side of the project, while a postdoc will be recruited to work on the research of the project (additional funding from *Agence AMIES*, see below).

CARTE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

We are currently working with the consortium “malware.lu”.

CASCADE Project-Team (section vide)

CASSIS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Research Result Transfer

The BZ-Testing-Tools technology has been transfered to LEIRIOS Technologies, at the end of 2004. LEIRIOS changed its name into 2007 and is now called Smartesting. The partnership between the Cassis project and the R&D department of Smartesting, located at the TEMIS Scientific and Industrial area at Besançon, will be continued through (national and international) projects or with a new transfer protocol. F. Bouquet is scientific consultant of Smartesting.

7.2. Study of the electronic voting system of Voxaly

Participants: Stéphane Glondu, Véronique Cortier.

A 4-month contract has been signed between Caramel, Cassis and Voxaly, a French company who is proposing solutions for the organization of on-line elections. During several meetings, we discussed their current solution and proposed improvements to gradually add security features that get close to the academic standards.

CASTOR Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Principia : Expertise on the solver of the numerical tool Deeplines (3 days, 3000 euros) - B. Nkonga
- IFPEN : Studies of coarsening strategies for the meshes used in reservoir simulations - H. Guillard

CELTIQUE Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Project with FIME

Participants: Thomas Jensen, Frédéric Besson, David Pichardie, Delphine Demange, Pierre Vittet.

Static program analysis, Javacard, Certification, AFSCM

- Partner : FIME
- Period: Starting January 2012; ending June 2013

The FIME contract consists in an industrial transfer of the Sawja platform 4.2 adapted to analyse Javacard programs according to AFSCM (Association Française du Sans Contact Mobile) security guidelines. The rules specify syntactic constraints but also more semantics properties such as the absence of certain runtime exceptions. FIME aims at automating the process of validating that Javacard applications are conformant to the rules. The outcome of the project is the Jacal (JAvaCard AnaLyser) (4.3 which takes a binary Javacard application; performs static analysis and output statuses for the different rules. Pierre Vittet has recently been recruited by FIME and the operational deployment of Jacal is in progress.

CEPAGE Project-Team (section vide)

CIDRE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- **DGA contract (2012-2013): "CAPALID"**

  The CAPALID project aims at building a state of the art of off-the-shelf solutions for supervision systems in distributed environments. We first realized a state of the art of the research activities for intrusion detection systems (probes), correlation systems and visualization systems. On a second phase, we defined an assessment methodology of these types of tools. Finally, this methodology was applied by Amossys, our partner in the project, to evaluate the best off-the-shelf tools that have been retained in the context of the project. This study is led in cooperation with Amossys, a SME located in Rennes.

- **Technicolor contract (2011-2014): "Data Aggregation in Large Scale Systems"**

  The theme of this contract focuses on the management of massively distributed data sets. Briefly, our goal is to provide a lightweight yet continuous flow of aggregate and relevant data from a very large number of distributed sources to a management system. Collaborative data aggregation are relevant mechanisms that could help in securely providing digests of information. However, an important aspect that we want to preserve is the privacy of the aggregated information. This is of particular interest for Telco operators or software/hardware providers in order to smoothly manage the current state of their deployed platforms, allowing accordingly to develop new applications based on quick reactions/optimizations to identify and handle services inconsistencies.

  This study is conducted in cooperation with the Inria project Dionysos.

- **HP contract (2013-2014): "Firmware Security"**

  The work we have conducted on the automatic instrumentation of C programs in order to detect intrusions has led to the implementation of the approach within the Frama-C framework under the form of a plugin called SIDAN (see above). A part of this contract for HP consists in adapting and improving this plugin for a real-word code provided by HP, in order to harden their source code.

  Another aspect of this work consists in developing a knew intrusion detection mechanism at the hardware level to protect the firmware (i.e. BIOS or UEFI) level. This mechanism must take into account industrial constraints provided by HP. Thomas Letan has been hired as an engineer to design and implement a proof-of-concept of such mechanism. In 2013, he focused his work on studying state-of-the-art and comparing existing approaches using metrics adapted to HP constraints.

7.2. Bilateral Grants with Industry

- **Amossys: "Evaluation of Intrusion Detection Mechanisms"**

  The PhD of Georges Bossert is done in the context of a Cifre contract with the SME Amossys (http://www.amossys.fr/). His work consists in proposing new approaches for protocol reverse-engineering. He developed Netzob, a tool dedicated to this task. The goal is to use this tool to generate realistic traffic during IDS assessment. In 2013, Georges has developed two important improvements of the protocol inference process he previously proposed. First, he improved the message format reverse engineering phase. Unlike previous work, our approach uses contextual information and its semantic definition as a key parameter in both the processes of message clustering and field partitioning. We can also detect complex linear and nonlinear relationships between value, size and offset of message fields using correlation-based filtering. Besides, our multi-step pre-clustering phase reduces the required computation time of the main clustering phase. These results

have been presented in an article that is under review. The second aspect of his work consisted in enhancing the grammar inference phase. He proposed a new approach that combines passive and active algorithms to infer protocol grammars. This approach also relies on grammar decompositions. Thus, he decreased inference time by using an action-based sequential decomposition and we took into account background noise by using a parallel decomposition. G.Bossert is also currently writing his PhD manuscript, with his defense being expected for mid 2014.

- **Orange Labs: "Data Persistence and Consistency in ISP Infrastructures"**

  Pierre Obame is doing his PhD thesis in the context of a cifre contract with Orange Labs at Rennes. Pierre Obame has proposed a distributed storage system called Mistore, dedicated to users who access Internet via a Digital Subscriber Line (DSL) technology. This system aims at guaranteeing data availability, persistence, and low access latency by leveraging millions of home gateways and the hundreds of Points of Presence (POP) of an Internet Service Provider (ISP) infrastructure. Pierre Obame has also proposed a mathematical framework for defining both strong and weak consistency criteria within the same formalism. Both weak and strong consistency criteria are offered by Mistore to its clients when they manipulate their data.

- **DGA-MI: "Security Events Visualization"**

  The PhD of Christopher Humphries on visualization is done in the context of a cooperation with DGA-MI. The objective is to propose new visulization mechnisms dedicated to the analysis of security events, for instance for forensic purposes. The tool ELVis presented earlier in this documents is the most recent contribution to this contract. It should be extended this year to allow the unified manipulation of multiple data sources.

- **DGA-MI: "Alerts Correlation Taking the Context Into Account"**

  The PhD of Erwan Godefroy is done in the context of a cooperation with DGA-MI. This PhD started in November 2012. The current work consists in the automatic generation of alert correlation rules in the context of deployed distributed systems. The correlation rules aim at being used by our GnG correlation system.

CLASSIC Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

An industrial contract with EDF R&D (cf. CIFRE PhD of Pierre Gaillard) has come into effect as of November 8, 2012, and will last 3 years.

CLIME Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Clime is partner with INERIS (National Institute for Environmental and Industrial Risks http://www.ineris.com/en) in a joint cooperation devoted to air quality forecast. This includes research topics in uncertainty estimation, data assimilation and ensemble modeling.

  Clime also provides support to INERIS in order to operate the Polyphemus system for ensemble forecasting, uncertainty estimations and operational data assimilation at continental scale.
- Clime is partner with IRSN http://www.irsn.fr/, the French national institute for radioprotection and nuclear safety, for inverse modeling of emission sources and uncertainty estimation of dispersion simulations. The collaboration aims at better estimating emission sources, at improving operational forecasts for crisis situations and at estimating the reliability of forecasts. The work is derived at large scale (continental scale) and small scale (a few kilometers around a nuclear power plant).
- Clime takes part to a joint Ilab with the group SETH (Numtech http://www.numtech.fr/). The objective is to (1) transfer Clime work in data assimilation, ensemble forecasting and uncertainty estimation, with application to urban air quality, (2) identify the specific problems encountered at urban scale in order to determine new research directions.

COATI Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. Contract CIFRE with Orange Labs, 02/2011 - 01/2014

Participants: Jean-Claude Bermond, Sébastien Félix.

"Convention de recherche encadrant une bourse CIFRE" on the topic *Smart Transports: optimisation du trafic dans les villes*.

7.1.2. Contract CIFRE with KONTRON, 11/2011 - 10/2014

Participants: Michel Syska, Mohamed Amine Bergach.

"Convention de recherche encadrant une bourse CIFRE" on the topic *Graphic Processing Units for Signal Processing* with joint supervision with AOSTE project.

7.1.3. ADR Network Science, joint laboratory Inria / Alcatel-Lucent Bell-labs France, 01/2013 - 12/2015

Participants: David Coudert, Aurélien Lancin, Bi Li, Nicolas Nisse.

COATI is part of the join laboratory Inria / Alcatel-Lucent Bell-labs France within the ADR Network Science and works on the fast computation of topological properties (hyperbolicity, covering, etc.) [36].

COFFEE Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

The project has industrial collaborations with Total, GDFSuez EP and Storengy on oil and gas recovery and gas storage.

The collaboration with Andra is concerned with the modelling and the simulation of mass and heat exchanges between porous media and ventilation channels. It leads to consider porous medium equations and hydrodynamic systems, coupled through intricate boundary conditions. Clearly one of the difficulties relies on the multiphase nature of the flows (at least water and air are present). We identify relevant physical scales, typical of the flows under consideration in nuclear waste engineering. We start by dealing with quite simple geometries, in order to discuss properly the order of magnitude of the different phenomena, and to design suitable schemes

COMETE Project-Team (section vide)

COMMANDS Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Safety Line

Following the "iMatch Contrôle Optimisation" event held at Inria Saclay on October 23rd (2012), a collaboration was initiated between COMMANDS and the startup Safety Line (http ://www.safety-line.fr), with a first contract on optimizing the ascent phase for commercial planes. A crucial aspect of this work is the identification of accurate and reliable models for the aerodynamic and thrust forces acting on the plane. For this study our partners at Safety Line provide us access to data recorded during several thousands of actual commercial flights, and COMMANDS recruited Stephan Maindrault as engineer to work on this project.

6.2. CNES

This contract between CNES and ENSTA lasted from February to December 2013, and was devoted to trajectory global optimization for an Ariane 5 launcher, using HJB techniques. The optimization was on the whole launch, including ballistic phases and the parameters of the intermediate GTO orbit, while maximizing the payload mass.

COMPSYS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Tirex Contract with Kalray

Compsys has a contract with Kalray called Tirex. The goal of this project is to prototype within the TireX toolbox (see Section 5.17) some new profiling/analysis techniques necessary to enable cloning. Because of the current financial problems encountered by Kalray, the efforts related to this project have been frozen until further notice.

7.2. ManycoreLabs Project with Kalray

Compsys is part of a bilateral grant with Kalray called ManycoreLabs, funded by "Investissements d'avenir pour le développement de l'économie numérique". The goal of this project is to allow the company Kalray, based on a collaboration with several partners, to become the European leader of the market of many-core chips for embedded systems. Industrial partners of this project include Bull, CAPS Entreprise, Digigram, Thales, Renault. Academic partners are CEA, Inria (Parkas and Compsys), VERIMAG.

The cloning/specialization work summarized in Section 6.3 and the generalized register tiling work summarized in Section 6.4 have been done in the context of this grant and correspond to WP 3.3.3. The research on OpenStream described in Section 6.15 corresponds to WP 2.5.3.

7.3. Technological Transfer Towards Zettice Start-Up

Participants: Christophe Alias, Adrian Muresan [Zettice], Alexandru Plesco [Zettice].

The Zettice start-up project has been initiated by Alexandru Plesco and Christophe Alias in March 2011, with the idea of transferring some of the research concepts emerging from the polyhedral model to the context of high-level circuit synthesis. Since, an important amount of applied research has been achieved to propose an effective technology ready for industrial transfer. From an academic perspective, Zettice is a unique opportunity to cover all the aspects of high-level synthesis from the front-end aspects (polyhedral code analysis and optimization) to the back-end aspects (pipelining, retiming, FPGA mapping) providing a global knowledge of relevant industrial issues.

Zettice received in 2012 the *"lean start-up award"* of the startup weekend labs 2012, the *"most exciting start-up mention"* at SAME 2012, and the *concours Crealys Excel&Rate 2012* grant (30 Keuros). In 2013, Zettice won the *concours OSEO 2013* grant (Banque Publique d'Investissement, 40 Keuros) and the *"most promising start-up award"* at SAME 2013.

A patent is under deposit. The research results related to Zettice are presented in Section 6.9 . The software tools developed in the context of Zettice are Dcc (see Section 5.8) and IceGEN (see Section 5.9).

CONTRAINTES Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Cifre PhD accompanying contract with General Electric Transportation on urban railway time tabling optimization (2011-2014).

7.2. Bilateral Grants with Industry

- DTI ITI support for the industrialization of our Rules2CP modeling software and technological transfer to SME KLS-Optim (2011-2013).

CONVECS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

Participants: Hubert Garavel, Abderahman Kriouile, Radu Mateescu, Wendelin Serwe.

Abderahman Kriouile is supported by a CIFRE PhD grant (from March 2012 to March 2015) from STMicroelectronics (Grenoble) on the verification of cache coherency in systems on chip (see § 6.5.1), under the supervision of Guilhem Barthes (STMicroelectronics), Christophe Chevallaz (STMicroelectronics), Grégory Faux (STMicroelectronics), Radu Mateescu (CONVECS), Wendelin Serwe (CONVECS), and Massimo Zendri (STMicorelectronics).

COPRIN Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Thales Alenia Space

Participants: David Daney [correspondant], Thibault Gayral, Jean-Pierre Merlet.

Thales Alenia Space, in partnership with the Coprin team, is studying a new concept of active space telescope. Based on a parallel architecture, its structure allows not only the telescope deployment in space but also the accurate positioning of the secondary mirror with respect to the primary one in order to improve the provided images quality. The deployment and re-positioning concepts were validated thanks to a first prototype, and the telescope performances improvement is currently under study. A first study brought to light the front-seat role of mechanical joints on the structure accuracy. However, in order to deal with the required optical accuracy and space constraints, those mechanical joints had to be replaced by flexible ones. A new prototype was then designed and built in order to validate its ability to ameliorate its images quality using flexible joints. The goal of this project is to self-calibrate the mechanical structure of the telescope: using only proprioceptive information, parameters of the robot model will be identified. Thus, a space telescope based on this concept will be able to reach its final orbit, and then to improve its image accuracy thanks to an autonomous procedure.

7.2. Airbus France

Participant: Yves Papegay.

To improve the production of numerical (flight) simulators from models of aerodynamics, Airbus France is interested in methods and tools like those described in 6.2.1 .

Following the contracts signed in 2003, 2005 and 2007 with the aircraft maker, and a consulting contract in 2008 to study the possible development of an industrial tool, we have initiated in 2009 a 2-years collaboration (extended in 2012) to enhanced the functionnalities and performances of the existing pieces of software belonging to Airbus and to turn them into a prototype that integrate and showcase our results. Final version of the resulting modeling and simulation environment has been licensed to Airbus through three successive transfer agreement signed in 2010, 2011, and 2012.

Enhancements and extensions developed in 2013 have also been licensed to Airbus this year. Transfer of know-how for industrialization and maintenance has been covered by a consulting contract.

CORIDA Project-Team (section vide)

CORTEX Team (section vide)

CQFD Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Astrium

Participants: Romain Azaïs, Adrien Brandejsky, Benoîte de Saporta, François Dufour, Anne Gégout-Petit, Christophe Nivot, Huilong Zhang.

The goal of this project is to propose models for fatigue of structure and to study an approach to evaluate the probability of occurrence of events defined by the crossing of a threshold. In this context, Astrium funded the PhD Thesis of Adrien Brandejsky (2009-2012) and is a partner of ANR Fautocoes. A new contract started in 2013 about the optimization of the assembly line of the future European launcher.

7.2. DCNS

Participants: Benoîte de Saporta, François Dufour, Huilong Zhang.

In september 2010, an industrial collaboration started with DCNS on the application of Markov Decision Processes to optimal stochastic control of a submarine to maximize the acoustic signature of a target vessel. In 2012, we extended our previous results to multiple target vessels and 3D control. We also coupled our code with the output of a tracking software to take more realistically into account the uncertainty on the position and speed of the targets. In 2013, we coupled our optimization procedure with the output of the tracking algorithms to estimate the positions of the targets.

7.3. Thales Optronique

Participants: Camille Baysse, Benoîte de Saporta, François Dufour, Anne Gégout-Petit, Jérôme Saracco.

Integrated maintenance, failure intensity, optimisation.

As part of optimizing the reliability, Thales Optronics includes systems that examine the state of their equipment . This function is performed by HUMS (Health Unit Monitoring Systems). The collaboration is the subject of the PhD of Camille Baysse (CIFRE). The aim of this thesis is to implement in the HUMS a program based on observations that can determine the state of the system, optimize maintenance operations and evaluate the failure risk of a mission. This work was presented in the conferences [33], [40] and is to appear in [18].

CRYPT Team (section vide)

DAHU Project-Team (section vide)

DANTE Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- A bilateral contract has been signed between the DANTE Inria team and ACT750 to formalise their collaboration in the context of churn prediction.
- A bilateral contract has been signed between the DANTE Inria team and KRDS to formalise their collaboration in the context of Facebook marketing / cascade analysis.
- A bilateral contract has been signed between the DANTE Inria team and HiKoB to formalise their collaboration in the context of the Equipex FIT (Futur Internet of Things) FIt is one of 52 winning projects in the Equipex research grant program. It will set up a competitive and innovative experimental facility that brings France to the forefront of Future Internet research. FIT benefits from 5.8 euros million grant from the French government Running from 22.02.11 – 31.12.2019. The main ambition is to create a first-class facility to promote experimentally driven research and to facilitate the emergence of the Internet of the future.

7.2. Inria Alcatel-Lucent Bell Labs joint laboratory

Participants: Isabelle Guérin Lassous, Paulo Gonçalves, Thomas Begin, Éric Fleury.

Network Science

The main scientific objectives of network science are:

- to design efficient tools for measuring specific properties of large scale complex networks and their dynamics;
- to propose accurate graph and dynamics models (*e.g.*, generators of random graph fulfilling measured properties);
- to use this knowledge with an algorithmic perspectives, for instance, for improving the QoS of routing schemes, the speed of information spreading, the selection of a target audience for advertisements, etc.

The ADR will focus on:

- Network sampling
- Epidemics in networks
- Search in networks
- Clustering of networks
- Detecting network central nodes
- Network evolution and anomaly detection

DEDUCTEAM Exploratory Action (section vide)

DEFI Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Contract with IFPEN on multiscale finite elements for two-phase flows in porous media (in the framework of the PhD thesis of F. Ouaki, defended in 2013).
- Contract with EADS/IW on topology optimization for composite panels drapping (in the framework of the PhD thesis of G. Delgado, defended in 2013).
- Contract with Renault on geometry and topology optimization of structures (in the framework of the two PhD theses of Ch. Dapogny, with the co-advising of P. Frey, to be defended in 2013, and G. Michailidis, with the co-advising of F. Jouve, to be defended in 2014).
- Contract with EDF R&D on non destructive testing of concrete materials (in the framework of the PhD thesis of Lorenzo Audibert, to be defended in 2015)
- Houssem Haddar has a contract with EDF R&D on data assimilation for temprature estimates in nuclear reactors (in the framework of the PhD thesis of Thibault Mercier, to be defended in 2015)
- Houssem Haddar is coordinating the contract EDF R&D on non eddy current non destructive testing. This contract involves Zixian Jiang and a two years PostDoc, Kamel Riahi.

7.2. Bilateral Grants with Industry

7.2.1. FUI Projects

- Gregoire Allaire is in charge of the RODIN project. RODIN is the acronym of "Robust structural Optimization for Design in INdustry". This is a consortium of various companies and universities which has been sponsored by the FUI AAP 13 for 3 years, starting on July 2012. The industrial partners are: Renault, EADS, ESI, Eurodecision, Alneos, DPS. The academic partners are: CMAP at Ecole Polytechnique, Laboratoire J.-L. Lions at Paris 6 and 7 Universities, centre de recherches Bordeaux Sud-Ouest at Inria. The goal of the RODIN project is to perform research and develop a computer code on geometry and topology optimization of solid structures, based on the level set method.
- Houssem Haddar is in charge of DEFI part of the FUI project Nanolytix. This three years project started in October 2012 and involves Xenocs (coordinator), imXPAD, Arkema, Inria (DEFI) and CEA-Leti. It aims at building a compact and easy-to use device that images nonaparticles using X-ray diffraction at small or wide angles (SAXS and WAXS technologies). We are in charge of direct and inverse simulation of the SAXS and WAXS experiments.
- Houssem Haddar is in charge of the electormagnetic simulation work package of the FUI project Tandem. This three years project started in December 2012 and involves Bull-Amesys (coordinator), BOWEN (ERTE+SART), Ecole Polytechnique (CMAP), Inria, LEAT et VSM. It aims at constructing a radar system on a flying device capable of real-time imaging mines embedded in dry soils (up to 40 cm deep). We are in charge of numerical validation of the inverse simulator.

DEMAR Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. IFP Energies Nouvelles

Accompanying PhD contract with IFPEN, in the framework of the PhD grant of A. Ben Khaled. The thesis explores new architectures and flexible scheduling methods to enhance the trade-off between the integration accuracy and the simulation speed of distributed real-time (hardware-in-the-loop) simulators, in particular in the framework of automotive power-trains.

7.1.2. MXM/CIFRE

CIFRE contract to fund the PhD thesis of Wafa Tigra. The purpose of this project is to develop a method to provide a limited set of commands to an upper extremity neuroprosthesis based on either intuitive motion using a limited number of commands to execute a set of important daily activities that require coordination.

DIANA Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- **ADR on Content Centric Networking** (2013-2016):
  The goal of this study in the context of the Inria - Alcatel Lucent Bell Labs laboratory is to work on the definition and the experimental evaluation of ICN mechanisms that use monitoring data to optimize network resource management and user Quality of Experience in today's networks. Massimo Gallo started his post-doc working on this topic early 2013. He was hired by AL-BL in march so he resigned from his post-doc position. The collaboration is currently in stand-by.

DICE Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Dice has bilateral contracts with three companies.

Worldline Wordline is a leader in B2B applications development, and is in the front line to provide new technical solution in the Web 2.0 era. We have a CIFRE partnership contract on the study of flow based architectures both at the data centers and at the Web browser level.

OrangeLabs We are finishing a joint work with OrangeLab on smart buildings and the management of home equipments. The project aims to provide a digital management layer for long living equipment that do not have network connexion for historical or technical reasons. The collaboration relies on a CIFRE partnership.

BullSA BullSA is producing and designing next generation Many-Core architecture. Although most of the time these calculators are used in real-time, closed environment such as military equipments, the dynamic, adaptability, and upgradable nature of systems is a real issue. We participate in a joint project to design a management layer for handling dynamic data flow application in a soft real-time context.

DIONYSOS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Cifre contract on Small Cell Networks

Participants: Adlen Ksentini, César Viho, Btissam Er-Rahmadi.

This is a Cifre contract (2013-2016) including a PhD thesis supervision, done with Orange Labs, on cooperation and self-* small cell networks. The aim is to define architectures and protocols for deploying small cell networks in AMEA (Africa, Middle East and Asia) countries.

7.2. Cifre contract on LOCARN: Low Opex and Capex Architecture for Resilient Networks

Participants: Adlen Ksentini, Bruno Sericola, Yassine Hadjadj-Aoul, Damien Le Quéré.

This is a Cifre contract (2012-2015) including a PhD thesis supervision, done with Orange Labs, on evaluating and developing a new plug-and-play routing protocol (called Low Opex and Capex Architecture for Resilient Networks – LOCARN), which do not require any network management or configuration.

7.3. Data aggregation for large-scale distributed networks

Participants: Bruno Sericola, Romaric Ludinard.

This is a 3-year (2011 – 2014) bilateral project with Technicolor R & D, France, on data aggregation for large-scale distributed networks. Along with the ubiquity of data and computing devices, comes the complexity of extracting and gathering relevant information for management purposes. The very distributed nature of sources of data (be they partially local applications at the user end, or hardware as gateways), as well as their ever increasing number prohibit a systematic and exhaustive gathering on a single (or few) central server for offline analysis. In this context, collaborative data aggregation, where some computing resources collaborate securely to provide digests, appears as an interesting application for both scalability and efficiency. Moreover, collecting information at a large scale poses the problem of privacy and data aggregation may allow preserving the privacy while collecting data.

7.4. IPChronos

Participants: Adlen Ksentini, Yassine Hadjadj-Aoul, Bruno Sericola, Pantelis Frangoudis.

We are working in the 3-year (September 2011 – September 2014) FUI Project IPChronos, where the main focus is in the use of the IEEE 1588 synchronization protocol over IP. Our contribution focuses on developing analytical models to estimate, based on the IEEE 1588 protocol, the end-to-end delay. IPChronos is leaded by ORALIA SPECTRACOM, and the partners are IPlabel and our team.

7.5. Celtic QuEEN

Participants: Sofiene Jelassi, Pantelis Frangoudis, Gerardo Rubino.

QuEEN (Quality of Experience Estimators in Networks) is a large 3-year Celtic project going from end 2011 to end 2014. Its objectives are to develop automatic QoE measurement modules for Web services and applications, and to organize these measurement modules as a network of cooperative agents in order to allow each agent to take advantage of the measurements done by the others. Dionysos is involved in most of the activities of the project, and it is expected that QuEEN will benefit from our experience in developing the PSQA technology. QuEEN involves many companies and academic institutions (22 European partners); the project leader is Orange Labs, in Sophia Antipolis.

DISCO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

A collaboration with SAGEM Défense Sécurité, Etablissement de Massy, has been developed on the effect of time-delay in inertially stabilized platforms for optical imaging systems. This collaboration led to research contract made by Alban Quadrat, Silviu Iulian Niculescu and Hugues Mounier (L2S, University Paris Sud).

DOLPHIN Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

- EDF (2011-2013): Bilevel mathematical programming and pricing problems.
- EDF (2011-2014): Scheduluing outages of nuclear plants.
- Tasker (2011-2014) : Scheduling of applications in hybrid cloud computing systems.
- Alicante (2010-2013): PhD of Julie Jacques. Knowledge extraction by optimization methods for improving the process of inclusion in clinical trials.
- Genes Diffusion (2010-2013): PhD of Julie Hamon. Analysis of data from high throughput genotyping: cooperation between statistics and combinatorial optimization.
- Strat&Logic (2012-2015): PhD of Sylvain Dufourny. Optimization of economic decisions in a competitive business management simulator.
- Vekia (2012-2015). The goal of the project is to develop an efficient and generic software for employee scheduling in retail.

DRACULA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

The industrial connections of the Dracula team have been made through the "Modeling of the immune response" project. Contacts have been established with both large pharmaceutical companies (Sanofi-Pasteur and Merial) and SMEs (Altrabio and Cosmo). The current ANR PrediVac incorporates the two aforementioned SMEs and will therefore strengthen the ties between Dracula and its industrial local ecosystem.

DREAM Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. ManageYourSelf: diagnosis and monitoring of embedded platforms

Participants: Marie-Odile Cordier, Sophie Robin, Laurence Rozé.

ManageYourSelf is a project that deals with the diagnosis and monitoring of embedded platforms, in the framework of a collaboration with Telelogos, a French company expert in mobile management and data synchronization. ManageYourSelf aims to perform diagnostic and repair on a fleet of mobile smartphones and PDAs. The idea is to embed on the mobile devices a rule-based expert system and its set of politics, for example "if memory full ’then delete (directory). recognition is performed, using the parameters of the phones as the fact base. Of course, it is impossible to foresee all the rules in advance. Upon detection of a non anticipated problem, a report containing all the system’s information prior to the problem is sent to a server. The learning step was first implemented using decision trees, the aim being to characterize the faults and consequently update the global knowledge base and its distributed instances. An incremental version of this learning step has been studied in order to get an on-line process [36]. This means being able to learn new faults characterizations and add new preventive rules, and also forget no longer needed ones.

DREAMPAL Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Collaboration contract with Nolam Embedded Systems: In conjunction with the CIFRE grant of Venkatasubramanian Viswanathan, a collaboration contract is established with Nolam ES. The objective is to design an innovative embedded computing platform supporting massively parallel dynamically reconfigurable execution model. The use-cases of this platform cover several application domains such as medical, transportation and aerospace.

7.2. Bilateral Grants with Industry

The FAMOUS project aims at introducing a complete methodology that takes the reconfigurability of the hardware as an essential design concept and proposes the necessary mechanisms to fully exploit those capabilities at runtime. The project covers research in system models, compile time and run time methods, and analysis and verification techniques. These tools will provide high-quality designs with improved designer productivity, while guaranteeing consistency with the initial requirements for adaptability and the final implementation.

Thus FAMOUS is a research project with an immediate industrial impact. Actually, it will make reconfigurable systems design easier and faster. The obtained tool in this project is expected to be used by both companies designers and academic researchers, especially for modern applications system specific design as smart camera, image and video processing, FAMOUS tools will be based on well established standards in design community. In fact, modeling will start from very high abstraction level using an extended version of MARTE. Simulation and synthesizable models will be obtained by automatic model to model transformations, using MDE approach. These techniques will contribute to shorten drastically time-to-market.

FAMOUS ended in December 2013. Its main result is a complete MDE tool for modeling, transforming and generating dynamically reconfigurable systems targeting Xilinx devices. This tool has been validated on a video processing application as a demonstrator.

DYLISS Project-Team (section vide)

DYOGENE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. CRE Inria-Orange

"Distribution of the SINR in real networks"
participants: B Błaszczyszyn, M. K. Karray (Orange Labs) and H.P. Keeler (hired by Inria as a research engineer) started 01/11/2013, ends 01/11/2014

7.2. Bilateral Grants with Industry

7.2.1. Alcatel Lucent

The collaboration with Alcatel Lucent (France) went on with the postdoctoral position of Chandramani Singh, funded by the Alcatel–Lucent/Inria joint lab. This materilized into two publications on the game theoretic analysis of Spatial Aloha, including one paper to appear in the Proceedings of Infocom'14.

7.2.2. Qualcom

The collaboration with Qualcomm (USA) led to a new line of research on the analysis of MAC protocols in Vehicular Networks. This materilized into a publications on the analysis of CSMA in dense Vehicular Networks that appeared in the Proceedings of IEEE Infocom'13, and in the hiring of Tien Viet Nguyen in the team of T. Richardson at Qualcomm NJ.

7.2.3. CIFRE Orange

PhD: Miodrag Jovanović
supervisorss: Bartek Błaszczyszyn, M.K. Karray

7.2.4. CIFRE Technicolor

PhD: Mathieu Leconte
supervisors: Marc Lelarge, Laurent Massoulié
title: Load-balancing and resource-provisioning in large distributed systems

E-MOTION Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. Toyota Motors Europe

[Feb 2006 - Feb 2009] [Dec 2010 - Dec 2014]

The contract with Toyota Motors Europe is a joint collaboration involving Toyota Motors Europe, Inria and ProBayes. It follows a first successful short term collaboration with Toyota in 2005.

This contract aims at developing innovative technologies in the context of automotive safety. The idea is to improve road safety in driving situations by equipping vehicles with the technology to model on the fly the dynamic environment, to sense and identify potentially dangerous traffic participants or road obstacles, and to evaluate the collision risk. The sensing is performed using sensors commonly used in automotive applications such as cameras and lidar.

This collaboration has been extended for 4 years and Toyota provides us with an experimental vehicle Lexus equipped with various sensing and control capabilities. Several additional connected technical contracts have been signed also.

6.1.2. Renault

[Jan 2010 - Feb 2013]

This contract was linked to the PhD Thesis of Stephanie Lefèvre. The objective is to develop technologies for collaborative driving as part of a Driving Assistance Systems for improving car safety. Both vehicle perception and communications are considered in the scope of this study. An additional short-term contract (3 months) has also been signed in november 2012.

6.1.3. PROTEUS

[November 2009 - October 2013]

PROTEUS (“Robotic Platform to facilitate transfer between Industries and academics”) is an ANR project involving 6 industrial and 7 academic partners. This projects aims to develop a software platform which helps to share methods and softwares between academics and industries in the field of mobile robotics.

The project works on three main aspects :

- Specification of different scenarios and its associated formalism.
- Definition of a domain specific language (DSL) to specify and execute the given scenarios.
- Setting up 4 robotic challenges to evaluate the capacity and the usability of the platform.

The contribution of *e-Motion* to PROTEUS is first to provide its expertise on mobile robotics to develop the DSL and next to provide a simulation environment with its platform “CycabTK”.

Juan Lahera-Perez has been recruited as engineer to work on this project with Amaury Nègre.

6.1.4. IRT-Nano Perfect (2012-2014, and 2015-2017)

Perfect is a project supported by ANR in the scope of the IRT (Technological Research Institute) Nano-electronic driven by the CEA (Nuclear Energy Agency). The partners of the project are the CEA-LETI LIALP laboratory, ST-Microelectronics and Inria. The goal of this project is to propose integrated solutions for “Embeeded Bayesian Perception for dynamic environments” and to develop integrated open platforms. During the first phase of the project (2012-2014), the focus is on the domain of transportation (both vehicle and infrastructure); health and smart home sectors will also be considered in the second phase (2015-2017).

6.2. Bilateral Grants with Industry

A Postdoc in Collaboration with the University of California Berkeley, Inria and Renault (Inria@SiliconValley fellowship) started in January 2013 on the topic of "Safety applications at road intersections for connected vehicle".

6.3. National Initiatives

6.3.1. Inria Large Initiative Scale PAL (Personaly Assisted Living)

[Nov 2010 - Nov 2014]

The objective of this project is to create a research infrastructure that will enable experiments with technologies for improving the quality of life for persons who have suffered a loss of autonomy through age, illness or accident. In particular, the project seeks to enable development of technologies that can provide services for elderly and fragile persons, as well as their immediate family, caregivers and social groups.

The Inria Project-Teams (IPT) participating in this Large-scale initiative action Personally Assisted Living (LSIA Pal) propose to work together to develop technologies and services to improve the autonomy and quality of life for elderly and fragile persons. Most of the associated project groups already address issues related to enhancing autonomy and quality of life within their work programs. This goal of this program is to unite these groups around an experimental infrastructure, designed to enable collaborative experimentation.

Working with elderly and fragile to develop new technologies currently poses a number of difficult challenges for Inria research groups. Firstly, elderly people cannot be classified as a single homogeneous group with a single behavior. Their disabilities may be classified as not just physical or cognitive, motor or sensory, but can also be classified as either chronic or temporary. Moreover, this population is unaccustomed to new technologies, and can suffer from both cognitive and social inhibitions when confronted with new technologies. None-the-less, progress in this area has enormous potential for social and financial impact for both the beneficiaries and their immediate family circle.

The spectrum of possible actions in the field of elderly assistance is large. We propose to focus on challenges that have been determined through meetings with field experts (medical experts, public health responsible, sociologists, user associations...). We have grouped these challenges into four themes: monitoring services, mobility aids, transfer and medical rehabilitation, social interaction services. These themes correspond to the scientific projects and expectations of associated Inria projects. The safety of people, restoring their functions in daily life and promoting social cohesion are all core motivations for this initiative.

e-Motion concentrates his work on mobility aids using the wheelchair.

6.3.2. ADT P2N

[Oct 2013 - Sept 2015]
The ADT P2N (Autonomous Navigation: From Perception to Navigation) involving e-Motion and Lagadic was accepted in 2012 for Lagadic and extended to emotion (with an IJD) in 2013. The ADT is dedicated to the development of a common software integrating perception and navigation methods developed in both teams. Demos will be done on various mobile robotic platforms such as wheelchairs, caddy...

ESPRESSO Project-Team (section vide)

EXMO Project-Team (section vide)

FLOWERS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Advanced platform for Urban Mobility (PAMU

Participant: David Filliat.

Development of a planning algorithm on a autonomous electric car for Renault SAS. We developped a planning module in order to produce global plans to reach a goal specified in a digital map and to perform local reactive planning to avoid dynamic obstacles. This module is integrated in the PAMU autonomous vallet parking developped by Renault with several academic partners.

7.2. Bilateral Grants with Industry

7.2.1. Development of an Contextual electronic copilot for driving assistance

Participant: David Filliat.

Financing of the CIFRE PhD grant of Alexandre Armand by Renault SAS with the goal of developping an Contextual electronic copilot for driving assistance based on the learning of the behavior of the driver.

FLUMINANCE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contrat CERSAT/IFREMER

This contract aims at studying image based data assimilation strategies for oceanic models incorporating random uncertainty terms. The goal targeted will consist in deriving appropriate stochastic version of oceanic model and on top of them to devise estimation procedures from noisy data to calibrate the associated subgrid models. This contract covers half of the funding of Valentin Resseguier PhD thesis.

FOCUS Project-Team (section vide)

FORMES Team (section vide)

FUN Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Etineo Partnership

Participants: Roudy Dagher, Fadila Khadar, Nathalie Mitton [correspondant].

EtiPOPS focuses on portability and flexibility of GOLIATH on several hardwares and in different environments (indoor and outdoor) through the deployment of different applications such as geolocalization. In order to favor the portability, designed solutions in EtiPOPS will respect on-going communication standards which will allow a greater interoperability between heterogeneous hardwares.

6.2. France Telecom partnership

Participants: Nathalie Mitton, Tahiry Razafindralambo [correspondant], Dimitrios Zormpas.

This collaboration aims to investigate rural networks and to deploy efficiently and dynamically such networks.

6.3. Traxens partnership

Participants: Natale Guzzo, Nathalie Mitton [correspondant].

This collaboration aims to set up a full protocol stack for TRAXENS's guideline.

GALAAD Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. Algebraic-geometric methods for design and manufacturing

This collaboration between Inria and Missler in the context of Carnot program, aims at developing algebraic-geometric computational techniques for the control of machining tools. It focuses on the problem of pocket manufacturing and the computation of medial axis and of offsets of planar regions with piecewise algebraic boundaries. An integration of plugins related to AXEL platform into the CAGD modeler TOPSOLID developed by Missler is planned. Laura Saini is involved in this collaboration.

GALEN Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- **General Electric HealthCare**:
  - Compressed Sensing Digital Subtraction Rotational Angiography [PhD thesis H. Langet]
  - Guide-wire Segmentation and Tracking of in interventional Imaging [PhD thesis N. Honnorat]
- **Intrasene**: Modeling, segmentation and registration of low gliomas brain tumors [PhD thesis S. Parisot]
- **Siemens**: Graph-based Knowledge-based Segmentation of the Human Skeletal Muscle in MR Imaging [PhD thesis P-Y. Baudin]

GALLIUM Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. The Caml Consortium

Participants: Xavier Leroy [correspondant], Damien Doligez, Didier Rémy.

The Caml Consortium is a formal structure where industrial and academic users of Caml can support the development of the language and associated tools, express their specific needs, and contribute to the long-term stability of Caml. Membership fees are used to fund specific developments targeted towards industrial users. Members of the Consortium automatically benefit from very liberal licensing conditions on the OCaml system, allowing for instance the OCaml compiler to be embedded within proprietary applications.

The Consortium currently has 11 member companies:

- CEA
- Citrix
- Dassault Aviation
- Dassault Systèmes
- Esterel Technologies
- Jane Street
- LexiFi
- Microsoft
- Mylife.com
- OCamlPro
- SimCorp

For a complete description of this structure, refer to http://caml.inria.fr/consortium/. Xavier Leroy chairs the scientific committee of the Consortium.

7.1.2. OCamlPro

Participant: Fabrice Le Fessant.

Fabrice Le Fessant is consulting for OCamlPro, a SME that provides services and tools to companies wanting to use OCaml as their development language.

GAMMA3 Project-Team

5. Bilateral Contracts and Grants with Industry

5.1. Bilateral Contracts with Industry

- Dassault Aviation, *Extraction de la topologie et simplification des détails géométriques*, P. Laug et H. Borouchaki, 66 k-euros, 2013-2015.
- Lectra, *Maillage et CAO paramétrée*, P. Laug et H. Borouchaki, 12 k-euros, 2013.

GANG Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. Radiocéros

Participant: Fabien Mathieu.

A contract has been signed between Inria, RadioCeros and the ARITT Center. Gang has provided a feasibility study on the subject of the use of Peer-to-peer mechanisms for high quality Internet radio.

6.1.2. Alcatel

Participants: François Durand, The-Dang Huynh, Leonardo Linguaglossa, Fabien Mathieu, Laurent Viennot.

Gang has a strong collaboration with Alcatel-Lucent. Fabien Mathieu has moved from Gang to Alcatel-Lucent in May 2013. We focus on three aspects of networks :

- François Durand is funded through an ADR with the LINCS for studying voting systems and how they can be used to take distributed decision in multipartite networks.
- The-Dang Huynh is funded through a CIFRE PhD. for developping pagerank techniques in the context of social networks.
- Leonardo Linguaglossa is funded through an ADR with Inria in the context of the joint laboratory for studying the feasibility of information centric networking with a special focus on routing aspects.

GECO Project-Team (section vide)

GENSCALE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. I-Lab Koriscale

In June 2013, GenScale and the Korilog Company created an Inria common structure research (I-LAB) called KoriScale. This is the outcome of a solid relationship, which has enable the transfer of the PLAST software (bank to bank genomic sequence comparison) from GenScale to Korilog. The resulting commercial product (Klast) is now 5 to 10 times faster than the reference software (Blast). The main research axe of the I-LAB focuses on comparing huge genomic and metagenomic datasets.

7.2. Sequence Comparison, Korilog

Intensive bank-to-bank comparison with Korilog : this collaborative project between the Korilog company and the GenScale team aims to investigate new research directions in the bank-to-bank sequence comparison problem. Two research axes are followed : constrained exploration of the search space and adaptation of the ORIS algorithm, developed by D. Lavenier for fast DNA comparison, to the protein sequences. It is funded for 3 months (Nov. 2012 - Feb. 2013).

7.3. Sequence Comparison, Kalray

Parallelization of PLAST on many cores : This collaboration aims to implement he PLAST software on the MPPA chip (256 cores) developed by the Kalray company. PLAST is a BLAST-like parallel implementation of the bank to bank genomic sequence comparison problem. More generally, the purpose, here, is to investigate the performances of the MPPA architecture on scientific life science software. This is a bilateral contract of 4 months, from April to August 2013.

7.4. Peapol

The Peapol project is funded by Sofiproteol company whose mission is to develop the French vegetable oil and protein industry, open up new markets, and ensure an equal distribution of value among its members. The Peapol project counts two collaborators, Biogemma, and INRA, the latter working in collaboration with the Genscale team, in charge of algorithmic research in the context of the project. This collaboration enabled to hire in the Genscale team Raluca Uricaru for 18 months on an INRA post doctoral position, followed by Susete Alves-Carvalho (engineer).

7.5. Rapsodyn

RAPSODYN is a long term project funded by the IA French program (Investissement d'Avenir) and several field seed companies, such as Biogemma, Limagrain and Euralis. The objective is the optimisation of the rapeseed oil content and yield under low nitrogen input. GenScale is involved in the bioinformatics workpackage, in collaboration with Biogemma's bioinformatics team, to elaborate advanced tools dedicated to polymorphism.

GEOMETRICA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Contrat Cifre with Geometry Factory

Mael Rouxel-Labbé's PhD thesis is supported by a Cifre contract with GEOMETRY FACTORY (http://www.geometryfactory.com). The subject is the generation of anisotropic meshes.

7.1.2. Commercialization of cgal packages through Geometry Factory

In 2013, GEOMETRY FACTORY (http://www.geometryfactory.com) had the following new customers for CGAL packages developed by GEOMETRICA:

GeoSoft (oil and gas, USA) : 2D constrained triangulation, AABB tree

British Geological Survey (oil and gas, UK) : 2D Meshes, Interpolation

Hexagon Machine Control (GIS, Sweden) 3D triangulations, point set processing

Thales (GIS, France) 2D constrained triangulation

GEOSTAT Project-Team (section vide)

GRACE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

- Within the framework of the joint lab Inria-ALU, Grace and Alcatel-Lucent collaborate on the topic of Private Information Retrieval: that is, retrieving data from a remote database while revealing neither the query nor the retrieved data. (This is not the same as data confidentiality, which refers to the need for users to ensure secrecy of their data, and is classically obtained through encryption, which prevents access to data in clear.) We are exploring applications of Locally Decodable Codes to Private Information Retrieval in the multi-cloud (multi-host) setting, to ensure both secure, reliable storage, and privacy of database queries. We will hire a PhD candidate in February 2014.

GRAND-LARGE Project-Team (section vide)

GRAPHIK Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. ABES

Participants: Michel Leclère, Michel Chein, Madalina Croitoru, Léa Guizol.

Collaboration with ABES. Funding of half a PhD grant (Léa Guizol, started in October 2011). See Section 6.3 .

7.2. CTFC

Participants: Patrice Buche, Jérôme Fortin, Awa Diattara.

We have initiated a national collaboration with the technical center of Comptois' cheese (CTFC : Centre Technique des Fromages Comtois). The objective of this collaboration is to design and test a platform for expert knowledge management. This will allow us to validate the integration of our theoretical tools into a real-world application and strengthen GraphIK's involvement in agronomy applications. A master degree internship in collaboration with CTFC was done by Awa Diattara (University Gaston Berger of Saint-Louis, Sénégal) in 2012. Awa Diattara came back as engineer to complete her work for a six month period in 2013.

This collaboration should be strengthened in 2014 in a enlarged project involving different traditional food chains (CNAOL, Conseil National des Appelations d'Origine Laitière).

7.3. Panzani

Participants: Patrice Buche, Jérôme Fortin, Laureline Estival, Bernard Cuq.

We have initiated a national collaboration with Panzani. The objective of this collaboration is to test and get new feedbacks about the platform for expert knowledge management. A master degree internship in collaboration with Panzani was done by an agronomy student, Laureline Estival (Agrosup Dijon), in 2013. This internship enabled us to validate the interest of our tool for Panzani and thus ensure that our developments and software could deal with several types of applications while being usable by non computer sciences experts.

Laureline Estival has continued her work, financed by Panzani, as an engineer to complete the knowledge base for a six month period in 2013-14.

HIEPACS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

ASTRIUM Space Transportation research and development contract:

- Design of a parallel version of the FLUSEPA software (Jean-Marie Couteyen (PhD); Jean Roman).

CEA Cadarache (ITER) research and development contract:

- Peta and exaflop algorithms for turbulence simulations of fusion plasmas (Fabien Rozar (PhD); Guillaume Latu, Jean Roman).

EDF R & D - SINETICS research and development contract:

- Design of a massively parallel version of the SN method for neutronic simulations (Moustapha Salli (PhD); Pierre Ramet, Jean Roman).

TOTAL research and development contracts:

- Parallel hybrid solver for massivelly heterogeneoux manycore platforms (Stojce Nakov (PhD); Emmanuel Agullo, Luc Giraud, Abdou Guermouche, Jean Roman).
- Parallel elastodynamic solver for 3D models with local mesh refinment (Yohann Dudouit (PhD); Luc Giraud and Sébastien Pernet at ONERA).
- Novel approaches to express fundamental algorithms using constructs that ensure their performance and scalability (G. Bosilca, visiting senior scientist).

HIPERCOM2 Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. OCARI2

Participants: Ichrak Amdouni, Pascale Minet, Cédric Adjih, Ridha Soua.

Partners: EDF, Inria.
The OCARI (Optimization of Ad hoc Communications in Industrial networks) project, funded by ANR, started in February 2007 and ended in 2010, EDF the coordinator decided to continue the project that deals with wireless sensor networks in an industrial environment. It aims at responding to the following requirements which are particularly important in power generation industry and in warship construction and maintenance:

- Support of deterministic MAC layer for time-constrained communication,
- Support of optimized energy consumption routing strategy in order to maximize the network lifetime,
- Support of human walking speed mobility for some particular network nodes, (e.g. sinks).

The development of OCARI targets the following industrial applications:

- Real time centralized supervision of personal dose in electrical power plants,
- Condition Based Maintenance of mechanical and electrical components in power plants as well as in warships,
- Environmental monitoring in and around power plants,
- Structure monitoring of hydroelectric dams.

To meet the requirements of supported applications (remote command of actuators, tele-diagnostic...), new solutions are brought to manage several communication modes, ranging from deterministic data transfers to delay tolerant transfers. A key issue is how to adapt routing algorithms to the industrial environment, taking into account more particularly limited network resources (e.g.; bandwidth), node mobility and hostile environment reducing radio range. The OCARI project aimed at developing a wireless sensor communication module, based on IEEE 802.15.4 PHY layer. In 2013, Inria took part with EDF to the specification of a simplified OCARI stack for a porting to a 32 bit platform.

HYBRID Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. Orange Labs

Participants: Pierre Gaucher, Anatole Lécuyer.

This grant started in October 2012 and supported Pierre Gaucher's CIFRE PhD program on "Novel 3D interaction techniques based on pseudo-haptic feedback".

7.1.2. Technicolor

Participants: Fabien Danieau, Anatole Lécuyer.

This grant started in January 2011 and supported Fabien Danieau's CIFRE PhD program on "Improving audiovisual experience with haptic feedback".

7.2. Bilateral Contracts with Industry

7.2.1. Mensia Technologies

Participants: Jozef Legény, Jussi Lindgren, Anatole Lécuyer.

Mensia Technologies is an Inria start-up company created in November 2012 as a spin-off of Hybrid team. Mensia is focused on wellness and healthcare applications emerging from the BCI and Neurofeedback technologies. The Mensia startup should benefit from the team's expertise and of valuable and proprietary BCI research results. Mensia is based in Rennes and Paris. Anatole Lécuyer and Yann Renard (former Inria expert engineer who designed the OpenViBE software architecture and was involved in team projects for 5 years) are co-founders of Mensia Technologies together with CEO Jean-Yves Quentel.

The contract between Hybrid and Mensia started in November 2013 and supported the transfer of several softwares designed by Hybrid team ("OpenViBE", "StateFinder") related to our BCI activity and our OpenViBE software (section 5.1) to Mensia Technologies for 5 years, for future multimedia or medical applications of Mensia.

7.2.2. MBA Multimedia

Participants: Ferran Argelaguet Sanz, Maud Marchal, Anatole Lécuyer.

This contract started in June 2013 and supported the transfer of several softwares designed by Hybrid team ("3D Cursors", "Elastic Images") in the frame of the W3D project (section 8.1.2) to MBA Multimédia company for future applications in the field of multimedia and web design based mainly on HTML5 and Word Press software.

7.2.3. Polymorph Studio

Participants: Ferran Argelaguet Sanz, Maud Marchal, Anatole Lécuyer.

This contract started in June 2013 and supported the transfer of several softwares designed by Hybrid team ("3D Cursors", "Pseudo-haptik", "Elastic Images") in the frame of the W3D project (section 8.1.2) to Polymorph Studio company for future applications in the field of multimedia and web design based mainly on Unity3D software.

Hycomes Team (section vide)

I4S Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. Contracts with SVS

Participants: Laurent Mevel, Michael Doehler.

Annual agreement Inria-SVS 2381 + contract 4329

I4S is doing technology transfer towards SVS to implement I4S technologies into ARTEMIS Extractor Pro. This is done under a royalty agreement between Inria and SVS .

6.2. Bilateral Grants with Industry

6.2.1. PhD CIFRE with Dassault Aviation

Participants: Laurent Mevel, Philippe Mellinger.

contract 7843.

Following the FliTE2 project, a joint PhD thesis between Inria and Dassault Aviation has been initiated. The thesis will pursue the work achieved in FliTE2 and started in June 2011 funded by Dassault Aviation and the CIFRE Agency.

6.3. Bilateral Grants with Industry

6.3.1. Collaboration with Bruel and Kjaer

Participants: Laurent Mevel, Ivan Gueguen.

Collaboration has started on analysis on wind turbines data.

IBIS Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Genostar

Participant: François Rechenmann.

Genostar, an Inria start-up created in 2004, provides bioinformatics solutions for the comparative analysis of bacterial genomes, proteomes and metabolomes. Genostar's software suite performs the annotation of sets of genomic sequences, *i.e.*, the identification of the coding sequences and other features, followed by the prediction of the functions of the gene products. The modules which make up the software suite were originally developed within the Genostar consortium and the HELIX project team at Inria Grenoble - Rhône-Alpes. The software suite also includes the modeling and simulation tool GNA developed by members of IBIS (Section 4.1). Genostar offers a comprehensive service line-up that spans genome sequencing, read assembly, annotation, and comparison. Genostar thus works with trusted subcontractors, each specialized in state-of-the-art sequencing technologies. François Rechenmann is CEO of the company. For more information, see http://www.genostar.com.

6.2. BGene

Participant: Johannes Geiselmann.

BGene is a start-up company of Université Joseph Fourier in the field of DNA engineering. BGene proposes efficient and custom-made modifications of bacterial genomes, leaving no scars or antibiotics resistance genes. The company has know-how and expertise at all stages of the development process, including the *in-silico* design of a desired construction, the choice of the appropriate genetic tools, and the delivery of the finished product. Former IBIS-member Caroline Ranquet and Johannes Geiselmann are co-founders of BGene, together with Marie-Gabrielle Jouan (Floralis, Université Joseph Fourier). BGene obtained an Emergence award in the 2013 Oséo Concours d'entreprises innovantes (see http://www.grain-incubation.com/oseo-start-ups-laureates-categorie-emergence/ for the press release). For more information on BGene, see http://www.bgene-genetics.com/.

IMAGINE Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts and Grants with Industry

6.1.1. EADS - Idealization of components for structural mechanics (06/2011 - 06/2014)

Participants: Flavien Boussuge, Stefanie Hahmann, Jean-Claude Léon.

Cifre PhD in partnership with EADS IW to generate the shape of mechanical components through dimensional reduction operations as needed for mechanical simulations, e.g. transformations from volume bodies to shells or plates forming surface models, usually non-manifold ones. The topic addressed covers also the shape detail removal process that takes place during the successive phases where subsets of the initial shape are idealized. Mechanical criteria are taken into account that interact with the dimensional reductions and the detail removal processes. The goal is to define the transformation operators such that a large range of mechanical components can be processed as automatically and robustly as possible. Two major results have been obtained to generate construction graphs from CAD models and use a construction graph to generate a dimensionnally reduced model suited for Finite Element Analyses.

6.1.2. EDF - Generating construction graphs of solids for physical simulation purposes (09/2013 - 09/2016)

Participants: Jean-Claude Léon, Aarohi Johal.

Cifre PhD in partnership with EDF to generate a construction graph of a CAD solid model from its description as in a STEP file in collaboration with Georges-Pierre Bonneau (Maverick project).This is a most frequent requirement in an industrial context where construction trees are lost when transfering models between CAD and simulation software. It is also critical to describe variants of construction processes of a solid because different modifications or different applications require different construction processes whereas a CAD software could provide only the construction process used when initially generating a solid. This project builds upon the construction graph generation process set up for dimensional reduction of solids and on the symmetry analysis of solids that have been addressed in the past years.

6.1.3. HAPTIHAND technology transfer project (Inria-HAPTION-Arts et Métiers ParisTech) (10/2012-08/2014)

Participants: Maxime Borettaz, Thomas Dupeux, Jean-Claude Léon.

The objective is to transfer a device, named HandNavigator, that has been developed in collaboration with Arts et Métiers ParisTech/Institut Image, as add on to the 6D Virtuose haptic device developed by HAPTION. The purpose of the HandNavigator is to monitor the movement of a virtual hand at a relatively detailed scale (movements of fingers and phalanxes), in order to create precise interactions with virtual objects like object grasping. This includes monitoring the whole Virtuose 6D arm and the HandNavigator in a virtual environment, for typical applications of maintenance simulation and virtual assembly in industry. The project covers the creation of an API coupled to physical engine to generate and monitor a realistic and intuitive use of the entire device, the creation of physical prototypes incorporating multiple sensors for each user's finger. The physical prototypes have been developed using rapid prototyping technologies like the 3D printing device available from the Amiqual4Home project (ANR-11-EQPX-0002).

IMARA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Valeo – "Driver Monitoring". Objective: achieve the state of the art of existing devices, algorithms and systems performing driver monitoring in real-time with embedded sensors.
- ADM Concept – "TRANS'YVES: Valet de Parking Automatisé". Two objectives: realize the control boards of the steering and the acceleration pedal of an automated vehicle, realize the automated valet using a single camera for vehicle guidance in a parking.
- AXTER Automation – "Laser-based navigation in industrial plants". Confidential.
- Valeo – "V50 project". Objective: dealing with intersection by an automated vehicle using on-board perception. This is the framework of the PhD thesis of Guillaume Tréhard.

IN-SITU Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

Mix3D - CIFRE Funding for Justin Mathew PhD thesis "New visualization and interaction techniques in spatial composition for mixing audio interfaces in the context of 3D spatial audio.", Coordinator: Stéphane Huot. Partners: Univ. Paris-Sud, ENS Louis-Lumière & DMS-Cinema. The project involves studying and designing new 'physical' and software interfaces for mixing spatial audio.

INDES Project-Team (section vide)

IPSO Project-Team (section vide)

KERDATA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Microsoft: Z-CloudFlow (2013-2016). In the framework of the Joint Inria-Microsoft Research Center, this project is a follow-up to the A-Brain project (see below). The goal of this new project is to propose a framework for the efficient processing of scientific workflows in clouds. This approach will leverage the cloud infrastructure capabilities for handling and processing large data volumes. In order to support data-intensive workflows, the cloud-based solution will: adapt the workflows to the cloud environment and exploit its capabilities; optimize data transfers to provide reasonable times; manage data and tasks so that they can be efficiently placed and accessed during execution. The validation will be performed using real-life applications, first on the Grid5000 platform, then on the Azure cloud environment, access being granted by Microsoft through a "Azure for Research Award" received by Gabriel Antoniu. The project will also provide funding for a PhD thesis to start in 2014. It is being conducted in collaboration with the Zenith team from Montpellier (led by Patrick Valduriez).

Microsoft: A-Brain (2010–2013). In the framework of the Joint Inria-Microsoft Research Center. See details in Section 4.1 . To support this project, Microsoft provided 2 million computation hours on the Azure platform and 10 TB of storage per year. The project funded a complementary expertise mission for Radu Tudoran (*Mission complémentaire d'expertise*, 3 years, started in October 2011).

LAGADIC Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Foundation EADS

Participants: Antoine Petit, Eric Marchand.

no. Inria Rennes 5605, duration: 36 months.

This contract ended in December 2013. It supported Antoine Petit's Ph.D. about 3D model-based tracking for applications in space (see Section 6.1.1).

7.1.2. Astrium EADS

Participants: Tawsif Gokhool, Patrick Rives.

no. Inria Sophia 7128, duration: 36 months.

The objective of this project that started in February 2012 is to investigate the general problem of visual mapping of complex 3D environments that evolve over time. This contract supports Tawsif Gokhool's Ph.D. (see Section 6.3.2).

7.1.3. ECA Robotics

Participants: Romain Drouilly, Patrick Rives.

no. Inria Sophia 7030, duration: 36 months.

This project started in May 2012. It aims at specifying a semantic representation well adapted to the problem of navigation in structured environment (indoors or outdoors). This contract is devoted to support the Cifre Convention between ECA Robotics and Inria Sophia Antipolis regarding Romain Drouilly's Ph.D.

LEAR Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. MBDA Aerospatiale

Participants: Albert Gordo, Michael Guerzhoy, Cordelia Schmid, Franck Thollard.

The collaboration with the Aerospatiale section of MBDA has been on-going for several years: MBDA has funded the PhD of Yves Dufurnaud (1999-2001), a study summarizing the state-of-the-art on recognition (2004), a one year transfer contract on matching and tracking (11/2005-11/2006) as well as the PhD of Hedi Harzallah (2007-2010). From September 2010 to 2013, we conducted a three-year contract on object localization and pose estimation based on shape representation.

7.2. MSR-Inria joint lab: scientific image and video mining

Participants: Anoop Cherian, Zaid Harchaoui, Yang Hua, Cordelia Schmid.

This collaborative project, which started in September 2008, brings together the WILLOW and LEAR project-teams with researchers at Microsoft Research Cambridge and elsewhere. It builds on several ideas articulated in the "2020 Science" report, including the importance of data mining and machine learning in computational science. Rather than focusing only on natural sciences, however, we propose here to expand the breadth of e-science to include humanities and social sciences. The project focuses on fundamental computer science research in computer vision and machine learning, and its application to archeology, cultural heritage preservation, environmental science, and sociology. Yang Hua is funded by this project.

7.3. MSR-Inria joint lab: structured large-scale machine learning

Participants: Julien Mairal, Zaid Harchaoui.

Machine learning is now ubiquitous in industry, science, engineering, and personal life. While early successes were obtained by applying off-the-shelf techniques, there are two main challeges faced by machine learning in the « big data » era : structure and scale. The project proposes to explore three axes, from theoretical, algorithmic and practical perspectives: (1) large-scale convex optimization, (2) large-scale combinatorial optimization and (3) sequential decision making for structured data. The project involves two Inria sites and four MSR sites and started at the end of 2013.

7.4. Xerox Research Center Europe

Participants: Zeynep Akata, Zaid Harchaoui, Cordelia Schmid.

The collaboration with Xerox started in October 2009 with a co-supervised CIFRE scholarship (2009-2012) on cross-modal information retrieval. A second three-year collaborative project on large scale visual recognition started in 2011. The goal is to design algorithms for large-scale image classification possibly in the presence of missing labels. The joint PhD student Zeynep Akata is supported by a CIFRE grant obtained from the ANRT. She graduated in early January 2014.

LFANT Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. DGA

Contract with *DGA maîtrise de l'information* about number theory and cryptography

- Duration: two years, 2011–2013 (ended May 2013)
- Scientific coordinator: J.-M. Couveignes
- Topics covered: index calculus and discrete logarithms, fast arithmetic for polynomials, pairings and cryptography, algorithmics of the Langlands programme

LINKS Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

Innovimax, Cifre and Engineer (2010-2014) The PhD thesis of Tom SEBASTIAN within the QUIXPROC project is supervised by J. NIEHREN in cooperation with M. ZERGAOUI the head of the INNOVIMAX company. The software development in this context is supported by D. DEBARBIEUX, a senior engineer co-funded by INNOVIMAX and INRIA.

LOGNET Team

7. Bilateral Contracts and Grants with Industry

7.1. myMed

Participants: Luigi Liquori, The Mymed Team.

Because of the rich founding of the interreg Alcotra myMed contract, also during 2013, we have started few collaborations under the form of “Contrat de prestations”. Without going too much into détails:

- Ludotic: “IHM for myMed”.
- David Da Silva, “autoentrepreneur”, “conception et implémentation de 3 social applications myMed”.
- Sonya Marcarelli “ “autoentrepreneur”, “porting of the social applications the Apple Store”.
- GIR MARALPIN: “mounting a critical mass for myMed in the euroregion AlpMed”.

M3DISIM Team (section vide)

MADYNES Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry: Inria-EDF Strategic action MS4SG

Participants: Laurent Ciarletta, Yannick Presse.

Vincent Chevrier and Julien Vaubourg (MAIA team, LORIA) are external collaborators.

The MS4SG (multi-simulation for smart grids) project is part of a strategic action between Inria and EDF. It is a joint work between the Madynes and MAIA teams from Inria-NGEt and EDF R&D.

The aim of the project is to provide primitives based on AA4MM in order to enable the multi-modeling and the multi-simulation of smart-grids.

Smart grids are energy power grids (electricity) endowed with smart capabilities because of the use of information and communication technologies. It can be seen as a combination of at least 3 layers : the power grid, the network used to collect information and control the system and an Information System. In Smart-grids, power/electricity utilities and distributors have to deal with multiple and variable sources of energy and of errors, the mandatory integration of smaller energy providers and a very variable set of users, while maintaining the necessary quality of service. All this at a scale than can be as big as a country. The IT+Network layers add the needed « smart » to allow dynamic adaptation of the different components and help forecast and therefore pilot the entire system. Smart grids correspond to new challenges because it is needed to re-think the way electricity is supplied to customers.

The idea behind MS4SG is to use simulation to help develop and evaluate future grids architectures, novel supervision techniques and to eventually control these systems. Instead of building a « super simulator ». Our approach is stemming from our AA4MM work, and consists in integrating simulators (and models) coming from at least the following initial different domains: electrical networks, communication networks and information systems. As these domains can influence each other, smart-grids can be considered as a kind of complex system and we are faced with multi-modeling and multi-simulation issues. Models in these simulators (and therefore simulators) are heterogeneous (at least equation based and event based models). In addition, each domain has developed is own set of software that should ideally be reused.

MAESTRO Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

MAESTRO members are involved in the Inria Alcatel-Lucent Bell Labs joint laboratory and participate in several ADRs (Action de Recherche/Research Action). The joint laboratory consists of three ADRs in its first phase (2008–2012) and six ADRs in its second phase (starting October 2012).

6.1.1. ADR "Semantic Networking" (January 2008 – April 2013)

Participants: Sara Alouf, Eitan Altman, Konstantin Avrachenkov, Oussama Habachi, Philippe Nain, Marina Sokol.

Coordinators are Isabelle Guérin Lassous (Inria project-team RESO) for Inria and Ludovic Noirie for Alcatel-Lucent.

The new paradigm of "semantic networking" for the networks of the future brings together "flow-based networking", "traffic-awareness" and "self-management" concepts to get "plug-and-play" networks. The natural traffic granularity is the flow. MAESTRO's task is to elaborate on the scheduling of flows in routers having in mind the fairness among flows with different round-trip times. A joint Inria Alcatel-Lucent patent has been filed in 2009 (inventors for Inria: S. Alouf, K. Avrachenkov, D. Carra, P. Nain). Two other patents (inventors for Inria: S. Alouf, K. Avrachenkov, A. Blanc) were filed in 2010 but withdrawn later by Alcatel-Lucent.

6.1.2. ADR "Self-Organized Networks in Wireless" (October 2012 –)

Participants: Eitan Altman, Majed Haddad, Manjesh Kumar Hanawal, Nessrine Trabelsi.

Coordinators are Bruno Gaujal (head of Inria project-team MESCAL) for Inria and Laurent Roullet for Alcatel-Lucent.

This ADR is a follow-up of the ADR "Self Optimizing Wireless Networks" from the first phase. Two joint Inria Alcatel-Lucent patents have been filed during the first phase, one in 2011 (inventors for Inria: E. Altman, S. Ramanath) and one in 2012 (inventors for Inria: E. Altman). Two joint Inria Alcatel-Lucent patents have been filed during the second phase, in 2013 (inventors for Inria: E. Altman, M. Haddad).

Majed Haddad and Eitan Altman have been working with Alcatel-Lucent on mobility issues in cellular networks. Various models have been proposed and developed in close collaboration with the business unit of Alcatel-Lucent.

6.1.3. ADR "Network Science" (January 2013 – January 2016)

Participants: Konstantin Avrachenkov, Jithin Kazhuthuveettil Sreedharan, Philippe Nain, Giovanni Neglia, Marina Sokol.

Coordinators are Philippe Nain and Konstantin Avrachenkov for Inria and Philippe Jacquet for Alcatel-Lucent.

"Network Science" aims at understanding the structural properties and the dynamics of various kind of large scale, possibly dynamic, networks in telecommunication (e.g., the Internet, the web graph, peer-to-peer networks), social science (e.g., community of interest, advertisement, recommendation systems), bibliometrics (e.g., citations, co-authors), biology (e.g., spread of an epidemic, protein-protein interactions), and physics. The complex networks encountered in these areas share common properties such as power law degree distribution, small average distances, community structure, etc. Many general questions/applications (e.g., community detection, epidemic spreading, search, anomaly detection) are common in various disciplines and will be analyzed in this ADR "Network Science".

6.2. Bilateral Grants with Industry

6.2.1. "Data Communication Network Performance" (December 2013 – December 2015)

Participants: Sara Alouf, Konstantin Avrachenkov, Philippe Nain, Giovanni Neglia.

Contractor: ALSTOM Transport (http://www.alstom.com/transport/)

Participants: Pierre Cotelle, Pierre Dersin, Sébastien Simoens.

The objective of this study is to build a simulation platform and and develop an evaluation methodology for predicting Quality of Service and availability of the various applications supported by the data communication system of train networks.

P. Nain is responsible for Inria.

MAGIQUE-3D Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts with TOTAL

- Schémas en temps d'ordre élevé pour la simulation d'ondes élastiques en milieux fortement hétérogènes par des méthodes DG.

  Period: 2010 November - 2013 October, Management: Inria Bordeaux Sud-Ouest, Amount: 150000 euros.

- Propagateurs optimisés pour les ondes élastiques en milieux anisotropes

  Period: 2011 November - 2014 October, Management: Inria Bordeaux Sud-Ouest, Amount: 160000 euros.

- RTM en milieux hétérogènes par équations d'ondes élastiques

  Period: 2011 November - 2014 October, Management: Inria Bordeaux Sud-Ouest, Amount: 160000 euros.

- Construction de milieux équivalents en vue de la simulation d'ondes élastiques harmoniques en milieux fortement hétérogènes par des méthodes DG

  Period: 2012 October - 2015 October, Management: Inria Bordeaux Sud-Ouest, Amount: 165000 euros

- Simulation de la propagation d'ondes élastiques et visco-élastiques en régime harmonique par des méthodes Galerkin discontinues d'ordre élevé en maillage non structuré adaptées au calcul haute-performance.

  Period: 2012 October - 2015 October, Management: Inria Bordeaux Sud-Ouest, Amount: 165000 euros

MAGNET Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

First, we are involved in the HERMES project along a collaboration with the SEQUELINRIA team and with a consortium of companies. In that collaboration, the envisioned applications is the design of recommender systems for commercial data. One objective is to provide social recommendations, that is to take into accounts in the recommendations, social relationships between users and the content of messages posted by users in forums.

Second, we start a one to one cooperation with the CLIC AND WALK company along the PhD thesis of PAULINE WAUQUIER. The company makes marketing surveys by consumers (called clicwalkers). The goal of the company is to understand the community of clicwalkers (40 thousands in one year) and its evolution with two objectives: the first one is to optimize the attribution of surveys to clicwalkers, and the second is to expand company's market to foreign countries. Social data can be obtained from social networks (G+, Facebook, ...) but there is no explicit network to describe the clicwalkers community. But users activity in answering surveys as well as server logs can provide traces of information diffusion, geolocalisation data, temporal data, sponsorship,... We will study the problem of adaptive graph construction from the clicwalkers network. Node (users) classification and clustering algorithms will be applied. For the problem of survey recommendations, the problem of teams constitution in a bipartite graphs of users and surveys will be studied. Random graph modeling and generative models of random graphs will be one step towards the prediction of the evolution of clicwalkers community.

Third, we have started a transfer collaboration with the MUSIC STORY company. In a first phase, we have considered the question of collecting musical metadata from heterogeneous sources. We have proposed machine learning methods and similarity measures for curating metadata. The MUSIC STORY company has close industrial collaborations with the DEEZER company. Current discussions between MAGNET and these two companies are open on social recommender systems for music.

Last, we work with physicians at the Lille hospital (CHRU) on the detection of brain anomalies related to epilepsy. Hence, we will use connectome data which is an approximate map of neural connections at different scales. The connectome can be modeled by a weighted graph. Available data include graphs constructed at different times for a given patient, also graphs for healthy patients and epileptic patients. One objective of the research project is to study how the connectome together with other signals, like functional magnetic resonance imaging (FRMI), MEG and EEG can be efficiently combined in order to detect abnormal brain regions. We will consider diffusion algorithms in graphs to test whether diffusion processes in the brain can be explained with the connectome. We will also consider learning algorithms related to information diffusion in order to enhance graph construction.

7.2. Bilateral Grants with Industry

7.2.1. Cifre SAP (2011-2014)

Participants: Thomas Ricatte, Gemma Casas Garriga, Marc Tommasi, Rémi Gilleron [correspondent].

GEMMA GARRIGA, and MARC TOMMASI supervise the PhD thesis (Cifre) of Thomas Ricatte together with Yannick Cras from SAP.

7.2.2. Cifre Clic and Walk (2013-2016)

Participants: Pauline Wauquier, Marc Tommasi, Mikaela Keller [correspondent].

MIKAELA KELLER and MARC TOMMASI supervise the PhD thesis (Cifre) of PAULINE WAUQUIER on graph-based recommandation together with Guillaume André from Clic and Walk.

MAGNOME Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

MAGNOME and the company BioLaffort are contracted to develop analyses and tools for rationalizing wine starter strain selection using genomics.

7.2. Bilateral Grants with Industry

The “SAGESS” project, below, section 8.1.1 , has been partially funded by a grant to BioLaffort from the Region.

MAGRIT Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

The partnership with GE Healthcare started in 1993. In the past few years, it bore on the supervision of CIFRE PhD fellows on the topic of using a multi-modal framework and augmented reality in interventional neuroradiology. A new PhD thesis -Charlotte Delmas- started in April 2013 with the aim to perform 3D reconstruction of tools in interventional neuroradiology. Our goal is to help clinical gesture by providing the physician with a better understanding of the relative positions of the tools and of the pathology.

MAIA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Inria-EDF Strategic action MS4SG

Participants: Vincent Chevrier, Julien Vaubourg.

Laurent Ciarletta and Yannick Presse (Madynes team, LORIA) are external collaborators.

The MS4SG (multi-simulation for smart grids) project is granted as a strategic action between Inria and EDF. This project is joint between the Inria teams Madynes and MAIA, and EDF R&D.

Smart grids are electric supply grids endowed with smart capabilities because of the use of information and communication technologies. This perspective of smart grids corresponds to new challenges ; in particular one must re-think the way electricity is supplied to customers and the power supply network is regulated.

The simulation approach can deal with the supervision and regulation of these systems. Such an approach implies to integrate simulators coming from different domains: electrical networks, communication networks and information systems. As these domains can influence each other, smart grids can be considered as a kind of complex system and we are faced with multi-modeling and multi-simulation issues; in particular we must deal with the fact that the models used in the different simulators are not of the same kind (heterogeneous simulations) and that we must link and re-use existing simulators that were designed to work alone on their own.

The aim of the project is to provide primitives based on AA4MM in order to enable the multi-modeling and the multi-simulation of smart grids.

MANAO Team

6. Bilateral Contracts and Grants with Industry

6.1. CIFRE PhD contract with Technicolor

Participants: C. Buron, G. Guennebaud and X. Granier

For this project, we aim to provide interactive generation and rendering for very large sceneries, based on grammars. We aim also to offer artist-friendly methods for controlling grammar behavior.

MARELLE Project-Team (section vide)

MASAIE Project-Team (section vide)

MATHRISK Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

PREMIA consortium: presently composed of Crédit Agricole CIB, and Natixis.

7.2. Bilateral Grants with Industry

Chair "Financial Risks" , Risk Foundation.
Partners: Ecole des Ponts ParisTech, Ecole Polytechnique, UPMC, Société Générale.

A. Alfonsi, B. Jourdain, B. Lapeyre.

MAVERICK Project-Team (section vide)

Maxplus Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contrats avec l'Industrie/Bilateral Contracts with Industry

- Modélisation et Résolution des problèmes de très grande taille dans les applications du yield management au réseau des télécommunications mobiles: CRE avec Orange Labs (responsable du suivi Orange Labs: Mustapha Bouhtou), signé en août 2013.

MC2 Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Program PREDIT

Participants: Charles-Henri Bruneau, Iraj Mortazavi.

Program PREDIT ADEME with Renault and Peugeot. The aim of this program is the work on drag reduction in order to decrease the fuel consumption.

7.2. Renault

Participants: Charles-Henri Bruneau, Iraj Mortazavi.

CARAVAJE project with ADEME (PREDIT Véhicules propres et économes) notified october 24th 2008. Collaboration with Renault and Peugeot, two PME and 3 labs to reduce the drag coefficient of a ground vehicle. 95 k euros for 3 years.

7.3. Plastic Omnium

Participant: Iraj Mortazavi.

The MC2 team works actually with the Plastic Omnium company in order to study the flow behaviour around square back ground vehicles (like buses, camions,...) using LES and DNS techniques. The main target of this collaboration is to identify the structures of velocity fields that generate aerodynamical losses, in order to design drag reduction control strategies using pulsed or synthetic jets. In the framework of this project, we also want to compute accurately instantaneous velocity fields, with high velocities. The computations should be performed on long time for complex geometries. A part of this work is included in the PhD thesis of Yoann Eulalie.

7.4. Contracts with Industry

Thierry Colin is Scientific consulting for the CEA CESTA. The CEA is funding the thesis of M. Latige and a grand of 30 k euros has been obtained.

Angelo Iollo is consulting with OPTIMAD engineering.

7.5. Grants with Industry

CIFRE - Conventions Industrielles de Formation par la REcherche - with VALEOL (VALOREM Group)

MCTAO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Thales Alenia Space - Inria

"Transfert orbital dans le problème des deux et trois corps avec la technique de propulsion faible".

This contract started October, 2012 for 3 years. It partially supports Helen Heninger's PhD.

The goal is to improve transfer strategies for guidance of a spacecraft in the gravitation field of one central body (the two-body problem) or two celestial bodies (three-body problem).

7.2. CNES - Inria - UMB

This three year contract will formally start in 2014, but discussion and preliminary work started in 2013.

It involves CNES and McTAO both through Inria and through Université de Bourgogne. It concerns averaging techniques in orbit transfers around the earth while taking into acount many perturbation of the main force (gravity for the earth considered as circular). The objective is to validate numerically and theoretically the approximations made by using averaging, and to propose methods that refine the approximation.

MESCAL Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts with Industry

7.1.1. Real-Time-At-Work

RealTimeAtWork.com is a startup from Inria Nancy-Grand Est created in December 2007. Bruno Gaujal is a scientific partner and a founding member of the startup. Its main target is to provide software tools for solving real time constraints in embedded systems, particularly for superposition of periodic flows. Such flows are typical in automotive and avionics industries who are the privileged potential users of the technologies developed by http://www.RealTimeAtWork.com.

7.1.2. ADR Selfnets with Alcatel

Selfnets is an ADR (*action de recherche*) of the common laboratory between Inria and Alcatel Lucent Bell Labs. Bruno Gaujal is co-leading the action with Vincent Roca. Selfnets is mainly concerned with self-optimizing wireless networks (Wifi, 3G, LTE). Eight Inria teams are participating in Selfnets. As for MESCAL, we mainly work on recent mobile equipment (e.g., using the norm IEEE 802.21) that can freely switch between different technologies (vertical handover). This allows for some flexibility in resource assignment and, consequently, increases the potential throughput allocated to each user. We develop and analyze fully distributed algorithms based on evolutionary games that exploit the benefits of vertical handover by finding fair and efficient user-network association schemes.

MEXICO Project-Team (section vide)

MICMAC Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Contracts and Grants with Industry

Many research activities of the project-team are conducted in close collaboration with private or public companies: CEA, SANOFI, Safety Line, ERAMET, IRDEP, EADS . The project-team is also supported by Office of Naval Research and European Office of Aerospace Research and Development, for multiscale simulations of random materials. All these contracts are operated at and administrated by the Ecole des Ponts.

6.2. National Initiatives

The project-team is involved in several ANR projects:

- the ANR MANIF focuses on the mathematical and numerical analysis of electronic structure models, such as, in particular, the Kohn-Sham model. It includes two research teams: researchers from the JL Lions Laboratory (Paris 6) and the Micmac team. It is coordinated by E. Cancès.
- E. Cancès is involved in the ANR BECASIM, which is concerned with the numerical simulation of Bose-Einstein condensates. This ANR has been accepted in June 2012, and is coordinated by I. Danaila (Université de Rouen).
- C. Le Bris participates to the ANR EMAQS. The scientist in charge is Karine Beauchard (CMLS, Ecole polytechnique).
- T. Lelièvre is member of the ANR-project "STAB" (PI: I. Gentil, Université de Lyon).

In addition, the team is participating in

- the GdR Quantum dynamics. This interdisciplinary research network is focused on physical and mathematical problems related to the time evolution of quantum systems (transport problems, nonequilibrium systems, etc),
- the GdR CoDFT,
- the GdR Maths et entreprise,
- the GdR correl (correlated methods in electronic structure computations),
- the GDR-CNRS 2434 Analyse des Equations aux Dérivées Partielles.

The MICMAC team project is involved in two Labex, namely the Labex Bezout (started in 2011) and the Labex MMCD (started in 2012).

We have invited the following National researchers to visit our team:

- A. Lozinski (University of Besançon): April 8-12 and Dec 16-20, 2013.

MIMETIC Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. Cifre Contract with Faurecia

Participants: Franck Multon [contact], Pierre Plantard.

This contract aims at developing new ergonomics assessments based on inaccurate Kinect measurements in manufactures on real workers. The main challenges are:

- being able to improve the Microsoft Kinect measurement in order to extract accurate poses from depth images while occlusions may occur,
- developing new inverse dynamics methods based on such inaccurate kinematic data in order to estimate the joint torques required to perform the observed task,
- and proposing a new assessment tool to translate joint torques and poses into potential musculoskeletal disorders risks.

Faurecia has developed its own assessment tool but it requires tedious and subjective tasks for the user, at specific times in the work cycle. By using Kinect information we aim at providing more objective data over the whole cycle not only for specific times. We also wish to make the user focus on the interpretation and understanding of the operator's tasks instead of taking time estimating joint angles in images.

This work is performed in close collaboration with an ergonomist in Faurecia together with the software development service of the company to design the new version of their assessment tool. This tool will be first evaluated on a selection of manufacture sites and will then be spread worldwide among the 270 Faurecia sites in 33 countries.

This contract enabled us to hire Pierre Plantard as a PhD student to carry-out this work in MimeTIC and M2S Lab. He started in January 2013 and will finish in December 2015.

MINT Project-Team (section vide)

MISTIS Project-Team (section vide)

MNEMOSYNE Team (section vide)

MOAIS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Contract with Bull (2013–2016). Multiobjective scheduling on supercomputer towards exascale. Associated to a CIFRE PhD grant (David Glesser, started in 4/2013). Partners: Inria - LIG Moais, Bull

7.2. Bilateral Grants with Industry

- Contract with EDF (2010-2013). High performance scientific visualization. Funds 1 postdoc and 1 PhD (Mathias Ettinger). Partners: Inria (MOAIS and EVASION), EDF R&D
- CEA: Collaboration with CEA (2012): Europlexus Parallelization with KAAPI. Partners: Inria Rhônes-Alpes and CEA Saclay (CEA funds the PhD of Marwa Sridi started in 4/2013).

MODAL Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Arcelor-Mittal

Participants: Christophe Biernacki, Clément Thery.

Subject: Supervised and semi-supervised classification on large data bases mixing qualitative and quantitative variables.

Arcelor Mittal faced some quality problems in the steel production which lead to supervised and semisupervised classification involving (1) a small number of individuals comparing to the numbers of variables, (2) heterogeneous variables, typically categorical and continous variables and (3) potentially highly correlated variables. A PhD CIFRE grant started on May 2011 on this topic.

7.2. Banque Accord

Christophe Biernacki gave a one-day course on the Rmixmod and BlockCluster packages to statistical members of the Banque Accord company.

7.3. Hi Duty Free

Participants: Christophe Biernacki, Serge Iovleff.

HiDutyFree had to solve a combinatorial optimization problem for optimizing its costumer service. For this contract we supervise two internships, giving a mathematical treatment of the problem of HiDutyFree and furnish a beta program based on ruby and java for solving it.

7.4. AGLAE

Participants: Julien Jacques, Cristian Preda, Florence Loingeville.

AGLAE aims to improve analyses, especially chemical and microbiological, of water and other matrices of the environment. In the context of the Ph.D. of Florence Loingeville, we work on ANOVA models for counting data.

7.5. Alicante

Participants: Julien Jacques, Cristian Preda, Florence Loingeville.

Alicante is member of the ANR TecSan ClinMine) we obtained for 2014-2018 to work on the path of patients at the hospital.

MODEMIC Project-Team (section vide)

MOISE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts with Industry

- A 3-year contract with EDF: project MeCSiCo (coupling methods for the simulation of river flows): see 4.4
- A 3-year contract with ARTELIA Group: funding for the PhD thesis of M.P. Daou (CIFRE): see 4.4
- A 2-year contract with ADEME and MAIA EOLIS on the thematic "Stochastic Downscaling Method": see 5.4 .
- A 4-year contract named ReDICE (Re Deep Inside Computer Experiments) with EDF, CEA, IRSN, RENAULT, IFP on the thematic computer experiments
- A 3-year contract with CEA Cadarache related to Simon Nanty's PhD.
- A 1-year contract with IFREMER on the thematic "Online degradation using the AGRIF software": see 5.1

MOKAPLAN Exploratory Action (section vide)

MORPHEME Project-Team

5. Bilateral Contracts and Grants with Industry

5.1. Bilateral Contracts with Industry

Participants: Grégoire Malandain, Thomas Benseghir [Asclepios].

The work of Thomas Benseghir, 3D/2D Coronary Registration for Interventional Cardiology Guidance, is supported by a CIFRE PhD fellowship from the General Electric Medical Helthcare company.

MORPHEO Team

7. Bilateral Contracts and Grants with Industry

7.1. Contract with Technicolor

A three year collaboration with Technicolor has started in 2011. The objective of this collaboration is to consider the capture and the interpretation of complex dynamic scenes in uncontrolled environments. A co-supervised PhD student (Abdelaziz Djelouah) is currently active on this topic [5] [10].

MUTANT Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Qwant

Together with Qwant, the MuTant team is in the process of defining and developing the Antescofo accompaniment engines for the entertainment industries on various mobile terminals.

MYRIADS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. EDF R&D (2010-2013)

Participants: Stefania Costache, Christine Morin, Nikos Parlavantzas.

The objective of our collaboration with EDF R&D is to design a resource management system for private clouds that provides support for different application SLAs while maximizing the resource utilization of the infrastructure. Stefania Costache's PhD work [11] is funded through a CIFRE grant with EDF R&D. In 2013, we have completed the implementation of the Merkat prototype and evaluated it with realistic applications provided by EDF R&D and with task farming and batch scheduling environments such as Condor and Torque [23], [22].

NACHOS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Seismic risk assessment by a discontinuous Galerkin method

Participants: Nathalie Glinsky, Stéphane Lanteri, Fabien Peyrusse.

The objective of this research grant with IFSTTAR http://www.ifsttar.fr (French institute of sciences and technology for transport, development and networks) and CETE Méditerranée is the numerical modeling of earthquake dynamics taking into account realistic physical models of geological media relevant to this context. In particular, a discontinuous Galerkin method will be designed for the solution of the elastodynamic equations coupled to an appropriate model of physical attenuation of the wave fields for the characterization of a viscoelastic material.

NANO-D Team (section vide)

NECS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. IFPEN

Accompanying PhD contract with IFPEN (IFP Energies Nouvelles), in the framework of the PhD grant of A. Ben Khaled. The thesis explores new architectures and flexible scheduling methods to enhance the trade-off between the integration accuracy and the simulation speed of distributed real-time (hardware-in-the-loop) simulators, in particular in the framework of automotive power-trains.

Accompanying PhD contract with IFPEN (IFP Energies Nouvelles), in the framework of the PhD grant of Giovanni de Nunzio. The thesis explores eco-driving for comunicating vehicles in urban environment.

NEUROMATHCOMP Project-Team (section vide)

NEUROSYS Team (section vide)

NON-A Project-Team (section vide)

NUMED Project-Team

5. Bilateral Contracts and Grants with Industry

5.1. Bilateral Contracts with Industry

- Sanofi Pasteur: design and implementation of a software to study drug stability. Currently used in a dozen of Sanofi projects, with large possibilities of expansion.
- Servier: four years framework agreement. PK PD modeling of new drug in oncology.

OAK Project-Team (section vide)

OASIS Project-Team (section vide)

OPALE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

ArcelorMittal-Inria industrial contract n. 5013 : Opale started a thorough collaboration in optimal design of high performance steel with the mentioned world leader industrial. The aim of the collaboration is to develop and study new and efficient tools dedicated to multicriteria shape optimization of structures which undergo large non-linear elasto-plastic deformations.

The present contract has three years duration and funds the Ph.D. thesis of Aalae Benki and Research financial support.

ORPAILLEUR Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. The BioIntelligence Project

Participants: Mehwish Alam, Yasmine Assess, Aleksey Buzmakov, Melisachew Chekol, Adrien Coulet, Marie-Dominique Devignes, Amedeo Napoli [contact person], Nicolas Pépin-Hermann, Malika Smaïl-Tabbone.

The objective of the "BioIntelligence" project is to design an integrated framework for the discovery and the development of new biological products. This framework takes into account all phases of the development of a product, from molecular to industrial aspects, and is intended to be used in life science industry (pharmacy, medicine, cosmetics, etc.). The framework has to propose various tools and activities such as: (1) a platform for searching and analyzing biological information (heterogeneous data, documents, knowledge sources, etc.), (2) knowledge-based models and process for simulation and biology in silico, (3) the management of all activities related to the discovery of new products in collaboration with the industrial laboratories (collaborative work, industrial process management, quality, certification). The "BioIntelligence" project is led by "Dassault Systèmes" and involves industrial partners such as Sanofi Aventis, Laboratoires Pierre Fabre, Ipsen, Servier, Bayer Crops, and two academics, Inserm and Inria. An annual meeting of the project usually takes place in Sophia-Antipolis at the beginning of July.

Two theses related to "BioIntelligence" are currently in preparation within the Orpailleur team. A first thesis is related to the mining of complex biological data using FCA and RCA techniques [37], [44]. The objective is to take advantage of Linked Open data in biology for helping the biologist querying complex data. There are needs to integrate data and knowledge from several web resources. Practical experiments will be led on biological data (clinical trials data and cohort data) also in accordance with ontologies lying at the NCBO BioPortal.

A second thesis is based on an extension of FCA involving Pattern Structures on complex data such as sequences and graphs [42], [41]. The idea is to extend the formalism of pattern structures to these complex data for being able to classify complex structures such as patient trajectories or molecular structures. The classification results (e.g. concept lattices) are expected to help practitioners in information retrieval tasks and specific problem solving.

7.2. The Quaero Project

Participants: Victor Codocedo [contact person], Ioanna Lykourentzou, Amedeo Napoli.

The Quaero project (http://www.quaero.org) is a program aimed at promoting research and industrial innovation on technologies for automatic analysis and classification of multimedia and multilingual documents. The partners collaborate on research and the realization of advanced demonstrators and prototypes of innovating applications and services for access and usage of multimedia information, such as spoken language, images, video and music.

In this framework, the Orpailleur team is working on information retrieval, document annotation and recommendation. The objective is to define methods and algorithms for achieving these complex tasks, based onKDDK techniques and especially the FCA technology.

A thesis is in preparation in the context of the Quaero project, where information retrieval and document annotation are especially studied, namely information retrieval guided by domain knowledge and classification of documents w.r.t. their annotations using FCA and pattern structures [48]. In addition, a related work was carried out on the reengineering of relational data within a concept lattice [58].

PANAMA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Contract with Canon Research Centre France SAS

Participants: Joachim Thiemann, Nancy Bertin, Frédéric Bimbot.

Duration: 1.5 years (2012–2013).

Research axis: 3.2.2

Partner: Canon Research Centre France SAS

This contract aims at transfering some of the research done within METISS/PANAMA to products developed by Canon Inc. Two patents were filed [50], [51]. Final internal report was delivered in October 2013.

7.1.2. Contract with Studio MAIA

Participants: Nancy Bertin, Frédéric Bimbot, Jules Espiau de Lamaestre, Jérémy Paret, Nathan Souviraà-Labastie.

Duration: 3 years (2012–2014).

Research axis: 3.2.2

Partners: Studio MAIA (Musiciens Artistes Interprètes Associés), Imaging Factory

This contract aims at transfering some of the research done within PANAMA towards new services provided by MAIA Studio.

More specifically, the main objective is to adapt source separations algorithms and some other advanced signal processing techniques elaborated by PANAMA in a user-informed context.

The objective is twofold:

- partial automation of some tasks which the user previously had to accomplish manually
- improved quality of separation and processing by exploiting user inputs and controls

The resulting semi-automated separation and processing will feed an integrated software used for the professional remastering of audiovisual pieces. A first version of PANAMA tools were integrated in the software developed by Imaging Factory and delivered to MAIA in December 2013.

7.2. Bilateral Grants with Industry

7.2.1. CIFRE contract with Technicolor R&I France on Compressive Sensing for the manipulation of large multimedia databases

Participants: Rémi Gribonval, Anthony Bourrier.

Duration: 3 years (2011-2014)

Research axis: 3.1.2

Partners: Technicolor R&I France, Inria-Rennes

Funding: Technicolor R&I France, ANRT

The objective of this thesis is to explore, both numerically and theoretically, the potential of compressive sensing for the manipulate of large (audiovisual) databases. A particular objective is to propose learning techniques that can work on strongly compressed versions of a large corpus of data while maintaining the ability to infer essential characteristics of the distribution of the items in the corpus.

PAREO Project-Team (section vide)

PARIETAL Project-Team (section vide)

PARKAS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Kalray 20K grant including the donation of an MPPA Developer workstation (with MPPA 256 accelerator) and support for a short-term research project (2 months of postdoc).
- Google Doctoral Fellowships of Tobias Grosser and Robin Morisset.

PAROLE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Our policy in terms of technological and industrial partnership consists in favoring contracts that quite precisely fit our scientific objectives.

A three-day consulting contract was conducted with Technicolor (Rennes) in December 2013.

E. Vincent is involved through his former team (PANAMA) in an 18-month bilateral research contract with Canon Research Centre France (Rennes) which ended in July 2013 and in a 30-month bilateral research contract with the SME Studio MAIA (Boulogne-Billancourt).

PARSIFAL Project-Team (section vide)

PERCEPTION Team (section vide)

PHOENIX Project-Team (section vide)

PI.R2 Project-Team (section vide)

POEMS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contract POEMS-CEA-LIST-2

Participant: Anne-Sophie Bonnet-Ben Dhia.

Start : 09/01/2010, End : 07/31/2013. Administrator : ENSTA.
This contract is about the scattering of elastic waves by a stiffener in an anisotropic plate.

7.2. Contract POEMS-CEA-LIST-DIGITEO

Participants: Anne-Sophie Bonnet-Ben Dhia, Sonia Fliss, Antoine Tonnoir.

Start : 10/01/2011, End : 09/30/2014. Administrator : ENSTA.
This contract is about the scattering of elastic waves by a local defects in an anisotropic plate. It consists on the funding of Antoine Tonnoir's Phd.

7.3. Contract POEMS-DGA

Participants: Anne-Sophie Bonnet-Ben Dhia, Sonia Fliss, Patrick Joly.

Start : 09/01/2011, End : 12/31/2013. Administrator : ENSTA.
This contract is about the waveguide in photonic crystals : we want to develop new mathematical and numerical tools for the characterization, the study and the computation of the guided modes in photonic crystals.

7.4. Contract POEMS-CEA-LIST

Participants: Marc Bonnet, Audrey Vigneron.

Start : 01/01/2013, End : 12/31/2015. Administrator : ENSTA.
This contract is about the modelisation of Eddy current by integral equations.

7.5. Contract POEMS-SHELL

Participants: Stéphanie Chaillat, Patrick Ciarlet, Luca Desiderio.

Start : 10/01/2010, End : 09/31/2016. Administrator : CNRS.
This contract is about fast direct solvers to simulate seismic wave propagation in complex media.

POLSYS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts and Grants with Industry

- Oberthur Technologies
  Oberthur Technologies is the World second largest provider of security and identification solutions and services based on smart card technologies for mobile, payment, transport, digital TV and convergence markets. Since 2007, SALSA co-supervised 3 internships of first year master student on cryptology in smart-cards, and one internship of a 2nd year master student. The goal of this last internship was to study the feasibility of implementing multivariate schemes in constrained environments (typically a smart card). A new jointly supervised PhD thesis (PolSys/Oberthur) has start in march 2012.
- Gemalto
  Gemalto is an international IT security company providing software applications, secure personal devices such as smart cards and token, etc.Governments, wireless operators, banks, and enterprises use Gemalto's software and personal devices to deliver mobile services, payment security, authenticated cloud access, identity and privacy protection, eHealthcare, eGovernment, transport ticketing and machine to machine (M2M) communications applications.

POMDAPI Project-Team

5. Bilateral Contracts and Grants with Industry

5.1. Bilateral Contracts with Industry

RTE (*Réseau de Transport de l'Électricité*) financially supports the supervision of the PhD thesis of C. Josz, through a convention that is part of the Cifre, which also partly finances the thesis. J. Ch. Gilbert is the thesis advisor.

Andra (*Agence Nationale pour la gestion des Déchets Radioactifs*) has sponsored the PhD of T. T. P. Hoang, (surpervised by J. E. Roberts, C. Japhet and M. Kern) on space–time domain decomposition methods for modeling ransport in porous media. This work was part of the Andra–Inria research agreement. The thesis was defended in December 2013 [1].

This work will be continued in the PhD of S. Ali Hassan (supervised by M. Vohralík), to integrate a posteriori error estimated, and adaptive stopping criteria for the iterative methods.

IFPEN (*Institut Français du Pétrole Énergies Nouvelles*) supports a collaboration on numerical methods for the flow simulation in porous media with fractures for modeling sedimentary basins or oil reservoirs. This collaboration concerns J. E, Roberts and J. Jaffré on the Inria side and I. Faille and A. Fumagalli on the IFPEN side.

5.2. Bilateral Grants with Industry

M. Vohralík, together with Vivette Girault (Université de Paris 6), have led the ERT (*Équipe de Recherche Technologique*) project between the Laboratoire Jacques-Louis Lions (LJLL) and IFPEN on "enhanced oil recovery and geological sequestration of CO_2: mesh adaptivity, a posteriori error control, and other advanced techniques". Project with an industrial partner designed to *overcome a technological issue*.

Popix Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

POPIX has a contract with Astrazeneca (November 2011 - November 2013)

POPIX has a contract with Lixoft (June 2011 - June 2014)

POTIOC Team (section vide)

Prima Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

Participants: Lucas Nacsa, James Crowley [correspondant].

PRIMA is currently working with Schneider Electric on algorithms image processing in a new generation of infrared visual sensors. The objective is to develop an integrated visual sensor with very low power consumption. Such systems can be used to estimate temperature in different parts of a room, as well as to provide information about human presence.

PRIVATICS Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. XDATA

Title: XDATA.

Type: FUI.

Duration: April 2013 - April 2015.

Coordinator: Data Publica

Others partners: Inria, Orange, EDF, LaPoste, Hurance, Cinequant, IMT.

See also: http://www.xdata.fr/.

Abstract: The X-data project is a “projet investissements d’avenir” on big data with Data Publica (leader), Orange, La Poste, EDF, Cinequant, Hurence and Inria (Indes, Privatics and Zenith) . The goal of the project is to develop a big data plaftform with various tools and services to integrate open data and partners’s private data for analyzing the location, density and consuming of individuals and organizations in terms of energy and services. In this project, the Zenith team leads the workpackage on data protection and anonymization.

PROSECCO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Contract with Airbus (http://www.airbus.com/), on the modeling and verification of avionic security protocols. Participant: Bruno Blanchet. From October to December 2013.

RAP Project-Team

5. Bilateral Contracts and Grants with Industry

5.1. Contracts

- CRE with Orange Labs " Dynamical Optical Networking in the Internet". Contract on bandwidth allocation algorithm in optical networks. Duration 2 years starting from 01/01/12.
- CELTIC-Plus Saser "Safe and Secure European Routing" submitted. RAP participates in the section on optical networks. Participants include Orange labs, Alcaltel-Lucent, Telecom Institute, ENSSAT as well as a number of German laboratories. Duration three years.
- ANR Project "CONNECT: Content-Oriented Networking: a New Experience for Content Transfer". The proposal submitted to the VERSO programme has been accepted. The planned starting date is January 2011 and the project is scheduled to last 2 years. The lead partner is Alcatel-Lucent Bell Labs France and the other partners are RAP, Inria/PLANETE, Orange LAbs, TelecomParisTech, UPMC.
- PGMO project "Systèmes de véhicules en libre-service: Modélisation, Analyse et Optimisation" with G-Scop (CNRS lab, Grenoble) and Ifsttar. From 1 to 3 years. Starting at 1/10/2013.
- The ANR Boole contract (Models for random Boolean functions and applications) has been transferred from the Algorithms project, and the funding will last until August 2013.
- PhD grant CJS (Contrat Jeune Scientifique) Frontières du vivant of INRA for Emanuele Leoncini.
- PhD grant CJS (Contrat Jeune Scientifique) Frontières du vivant of INRA for Renaud Dessalles.

5.2. Bilateral Grants

- A bilateral project PHC Tournesol funded by Campus France (formerly Egide) will cover the costs of exchanges between *Nicolas Broutin* and Stefan Langerman (FNRS, UL Brussels). The topic of the collaboration is coloration of random hypergraphs for channel assignment in networks.

REALOPT Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contract with EDF on maintenance planning

We are currently working on a project aiming to plan the energy production and the maintenance breaks for a set of nuclear power plants generating electricity. We consider the large-scale power plant maintenance scheduling and production planning problem submitted by EDF to the 2010 Euro/Roadef Challenge. Two types of power plants are used to satisfy a customer demand over a specific time horizon. Type 1 plants can operate continuously while Type 2 plants have to be shut down regularly for refuelling and maintenance, and cannot produce during outage periods. The decision to be made consists of the dates of outages, the amount of refuel for Type 2 plants, and production level for both types of plants. The objective is to minimize the average cost of refuelling and production on various demand scenarios. In this work, we propose a novel column generation approach based on extended formulation which enables to solve within a few minutes a deterministic instance of the problem on a three years horizon, which is within the time frame of the operational tools currently used by EDF. Moreover, the approach can easily account for various demand scenarios. Our approach is tested on real life instances within a rolling horizon framework.
This project is carried in collaboration between EDF R&D (OSIRIS lab) Inria team Dolphin and Realopt.

7.2. Collaboration with ERTUS on sanitary treatment planning

In planning winary operations (most importantly sanitary treatments on the wine tree) under wheather forcast uncertainty, one searches for solutions that remain feasible and "cheap" in case of perturbation in the data. We consider the planning and scheduling of the operations that arise over a one-year horizon. More precisely, the operations to be sheduled include tasks related to soil care, or grape tree care: cutting, line building, thinning out leaves, ..., and chemical treatments. The latter are a main focus of our study since one of the principal goals of better planning is to reduce the amount of chemical treatments by selecting the appropriate products and schemes, but also by spacing out treatements while guarantying a desease free vineyard with some confidence. Each of the scheduled tasks requires its own resource, so the planning also triggers equipement and raw products selection decisions. The objective is to minimize both equipment and product costs augmented by an evaluation of the hazard of chemical product use. The planning should be "robust" to seasonal variations on the proper time frame for scheduling tasks.

7.3. Collaboration with Exeo-Solutions on dimensionning a vehicle fleet for waste collection

Through the internships of Damien Trut and Youcef Magnouche in Exeo, and the current work of Pierre Pesneau, we study the optimization of partitionning a urban area into zones that shall be assigned to vehicles for waste collection. The goal is to minimize the distance traversed by the vehicles in each zone. This can be modeled as a clustering problem with side constraints: zones assigned to a same cluster must be contiguous and satisfy capacity and time constraints.

7.4. Collaboration with B-Travel on a yield management problem

Through the PhD thesis of Martin Bué (in collaboration with inria team Dolphin), we are now working with society B-Travel on pricing and yield management. The goal is to find the best prices and incentives in the context of professional travel. The techniques used are based on network-flow formulations and mathematical programming.

7.5. Collaboration with Vekia on an employee-scheduling problem

Through the PhD thesis of Matthieu Gérard (in collaboration with inria team Dolphin), we are now investigating a very rich version of employee-scheduling problem. We have designed an efficient algorithm for computing the best shift for each employee, based on dynamic programming. This method is used in a greedy algorithm to find solutions in a faster manner, and in a branch-and-price method to prove the optimality of the solution.

REGAL Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

- Metaware Technologies, 31,250 euros for the development of Coccinelle. Metaware offers software renovation services. It is using Coccinelle to modernize a large legacy C application for a client.
- Orange Lab, 90,000 euros for 3 PhD Students (CIFRE), Ralucca Diaconu, Guthemberg Da Silva Silvestre, and Koutheir Attouchi
- Renault, 60,000 over 3 years (2013 - 2016) for a CIFRE. In the context of a Cifre cooperation with Renault, we are supervising the PhD of Antoine Blin on the topic of scheduling processes on a multicore machine for the automotive industry. The goal is to allow real-time and multimedia applications to cohabit on a single processor. The challenge here is to control resource consumption of non real-time processes so as to preserve the real-time behavior of critical ones. As part of this cooperation, we will use the Bossa DSL framework for implementing process schedulers that we have previously developed.

6.2. Bilateral Grants with Industry

6.2.1. Joint PhD: CRDTs for Large-Scale Storage Systems, with Scality SA

We are starting a research project (CIFRE: industrial PhD) with the French start-up company Scality, on CRDTs for large scale storage systems.

Storage architectures for large enterprises are evolving towards a hybrid cloud model, mixing private storage (pure SSD solutions, virtualization-on-premise) with cloud-based service provider infrastructures. Users will be able to both share data through the common cloud space, and to retain replicas in local storage. In this context we need to design data structures suitable for storage, access, update and consistency of massive amounts of data at the object, block or file system level.

Current designs consider only data structures (e.g., trees or B+-Trees) that are strongly consistent and partition-tolerant (CP). However, this means that they are not available when there is a network problem, and that replicating a CP index across sites is painful. The traditional approaches include locking, journaling and replaying of logs, snapshots and Merkle trees. All of these are difficult to scale using generic approaches, although it is possible to scale them in some specific instances. For instance, synchronization in a single direction (the Active/Passive model) is relatively simple but very limited. A multi-master (Active/Active) model, where updates are allowed at multiple replicas and synchronization occurs in both directions, is difficult to achieve with the above techniques.

Our previous work has shown that many storage indexing operations commute; this enables a the highly-scalable CRDT approach. For those that do not, Red-Blue-Purple approach (Section 5.3.6) appears promising.

The objective of the joint research will be to design new algorithms for object, block and file storage systems. Note that these thee kinds of systems, although related, support different kinds of operations, and have different consistency requirements.

REGULARITY Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

The Tandem Project is a consortium involving several industrial companies (e.g. Bull Amesys) and some research laboratories (e.g. CMAP). The aim is to detect landmines from 3D radar images.

REO Project-Team (section vide)

REVES Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. Autodesk

Participants: Adrien Bousseau, George Drettakis, Clement Riant, Sylvain Duchene.

We extended our technology transfer agreement with Autodesk concerning the RID technology on single-lighting condition intrinsic images. We transfered a first version of the software on Autodesk servers.

6.2. Bilateral Grants with Industry

6.2.1. Autodesk

Participants: Adrien Bousseau, George Drettakis, Clement Riant, Sylvain Duchene.

Autodesk has offered a significant research donation to REVES in support of our work on intrinsic images. Autodesk has also donated several licenses of Maya, 3DS Max and SketchBookPro.

6.2.2. Adobe

Participants: George Drettakis, Gaurav Chaurasia.

Adobe has offered a small donation in the context of the Halide project (Sec. 5.1.4). Adobe has also signed an evaluation license for the Vector Shade Trees software developed in the context of [14].

RMOD Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Resilience FUI

Participants: Nicolas Petton [Correspondant], Stéphane Ducasse, Damien Cassou.

Contracting parties: Nexedi, Morphom Alcatel-Lucent Bell Labs, Astrium Geo Information, Wallix, XWiki, Alixen, Alterway, Institut Télécom, Université Paris 13, CEA LIST.

Resilience's goal is to protect private data on the cloud, to reduce spying and data loss in case of natural problems. Resilience proposes to develop a decentralized cloud architecture: SafeOS. Safe OS is based on replication of servers. In addition a safe solution for documents should be developed. Sandboxing for Javascript applications should be explored.

There is a plethora of research articles describing the deep semantics of JavaScript. Nevertheless, such articles are often difficult to grasp for readers not familiar with formal semantics. In our first report, we propose a digest of the semantics of JavaScript centered around security concerns. This report proposes an overview of the JavaScript language and the misleading semantic points in its design.

7.2. SafePython FUI

Participants: Damien Cassou [Correspondant], Jean-Baptiste Arnaud, Stephane Ducasse.

Contracting parties: CEA, Evitech, Inria, Logilab, Opida, Thales, Wallix.

Beyond embedded computing, there is not so much research and development on the verification of software safety. Recently, some tools have been created for languages such as JAVA, SQL, VB or PHP. Nevertheless, nothing exists for Python even though this language is growing fast. SafePython's goal is to provide code analysis tools applicable to Python programs. This project will define a subset of Python that the developers will have to use to have their programs analyzed.

7.3. Generali France

Participants: Nicolas Anquetil [Correspondant], Stéphane Ducasse, Guillaume Larcheveque, Muhammad Bhatti, Camille Teruel.

Contracting parties: Synectique, Generali Assurances http://www.generali.be.

RMoD is looking into providing a software solution to Generali France for its software maintenance. The goal is to support decision making by providing quality metrics and softare dependance information. The partner needs tools for parsing their legacy code (in a specific, not well-known language) and help in assessing quality and identifying dead code or code duplication. This should serve as an essential element of decision support in the continuing evolution of an important software system of the partner.

7.4. Pharo Consortium

We launched the Pharo Consortium. It has 13 members, 6 academic partners and 3 sponsoring companies. Inria supports the consortium with one full time engineer starting in 2011. More at http://consortium.pharo.org.

ROMA Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Related to evolutions of the MUMPS solver (see Section 5.1), and in order to continue funding two engineers while working on the design of a consortium of industrial users, we worked on the following contracts with industry, that were managed by CERFACS and INPT, respectively:

- Total/Hutchinson. In this contract, we worked more specifically on numerical aspects related to rank detection and null-space computations. This feature will be available in a future version of the solver.
- ESI-Group. We worked on modified pivoting strategies for hard symmetric indefinite problems. The proposed solutions could be validated by the industrial partner. This feature will be available in the next release of our package.

RUNTIME Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

SAMSUNG We have signed a contract with the Samsung company to work on the *Generation of Parallel Patterns based programs for hybrid CPU-GPU architectures* from october 2012 to september 2013.

7.2. Bilateral Grants with Industry

STMicroelectronics STMicroelectronics is granting the CIFRE PhD Thesis of Paul-Antoine Arras on *The development of a flexible heterogeneous system-on-chip platform using a mix of programmable processing elements and hardware accelerators* from October 2011 to October 2014.

TOTAL TOTAL is granting the CIFRE PhD thesis of Corentin Rossignon on *Sparse GMRES on heterogeneous platforms in oil extraction simulation* from april 2012 to march 2015.

CEA CEA is granting the CIFRE PhD thesis of Emmanuelle Saillard (2012-2015) on *Static/Dynamic Analysis for the validation and optimization of parallel applications* and Grégory Vaumourin (2013-2016) on *Hybrid Memory Hierarchy and Dynamic data optimization for embedded parallel architectures*

CEA - REGION AQUITAINE CEA together with the Aquitaine Region Council is funding the PhD thesis of Marc Sergent (2013-2016) on *Scalability for Task-based Runtimes*.

SAGE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. ANDRA: Numerical methods for reactive transport

Participants: Édouard Canot, Jocelyne Erhel, Souhila Sabit.

Title: Numerical methods for reactive transport.
Time: October 2010-October 2013
Partner: ANDRA Coordination: J. Erhel, with G. Pépin (ANDRA)

Abstract: It is quite challenging to develop a numerical model for deep storage of nuclear waste. The time interval is very large (several thousands years), models are coupled and simulations must be accurate enough to be used for risk assessment. In most cases, chemistry must be included in models of deep geological storage. We have developed an efficient global method coupling transport and chemistry by a Newton-type algorithm. See sections 6.3.4 , 4.2 , 8.2.7 , 5.1.6 .

SCIPORT Team (section vide)

SCORE Team (section vide)

SECRET Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

- **High Tech Communications Services** ($09/13 \rightarrow 09/14$)
  Recovering a convolutional encoder followed by a block interleaver
  19 kEuros

SECSI Project-Team (section vide)

SELECT Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contract with EDF

Participants: Jairo Cugliari, Jean-Michel Poggi.

SELECT has a contract with EDF regarding wavelet analysis of the electrical load consumption for the aggregation and desagggregation of curves to improve total signal prediction.

7.2. Contract with SNECMA

Participants: Gilles Celeux, Rémy Fouchereau, Patrick Pamphile.

- SELECT has a contract with SAFRAN - SNECMA, an high-technology group (Aerospace propulsion, Aicraft equipment, Defense Security, Communications),regarding modelling reliability of Aircraft Equipment.

SÉMAGRAMME Project-Team (section vide)

SequeL Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Deezer, 2013-2014
  Participants: Jérémie Mary, Philippe Preux, Romaric Gaudel.

  A research project has started on June 2013 in collaboration with the Deezer company. The goal is to build a system which automatically recommends music to users. That goal is an extension of the bandit setting to the Collaborative Filtering problem.
- Nuukik, 2013-2014
  Participant: Jérémie Mary.

  Nuukik is a start-up from Hub Innovation in Lille. It proposes a recommender systems for e-commerce based on matrix factorization. We worked with them specifically on the cold start problem (*i.e* when you have absolutely no data on a product or a customer). This led to promising result and allowed us to close the gap between bandits and matrix factorization. This work led to a patent submission in december 2013.
- TBS, 2012-2013
  Participants: Jérémie Mary, Philippe Preux.

  A research project has started in September 2012 in collaboration with the TBS company. The goal is to understand and predict the audience of news related websites. These websites tend to present an ergodic frequentation with respect to a context. The main goal is to separate the effect of the context (big events, elections, ...) and the impact of the policies of the news websites. This work is based on data originating from major French media websites and also involves research of tendencies on the web (as Google Trends and Google Flu do). Used algorithms mix methods from time series prediction (ARIMA and MARSS models) and machine learning methods (L1 penalization, SVM).
- Squoring Technologies, 2011-2014
  Participants: Boris Baldassari, Philippe Preux.

  Boris Baldassari has been hired by Squoring Technologies (Toulouse) as a PhD student in May 2011. He works on the use of machine learning to improve the quality of the software development process. During his first year as a PhD student, Boris investigated the existing norms and measures of quality of software development process. He also dedicated some time to gather some relevant datasets, which are made of either the sequence of source code releases over a multi-years period, or all the versions stored on an svn repository (svn or alike). Information from mailing-lists (bugs, support, ...) may also be part of these datasets. Tools in machine learning capable of dealing with this sort of data have also been investigated. Goals that may be reached in this endeavor have also been precised.
- INTEL Corp., 2013 - 2014
  Participants: Philippe Preux, Michal Valko, Rémi Munos, Adrien Hoarau.

  This is a research project on Algorithmic Determination of IoT Edge Analytics Requirements. We are attempting to solve the problem of how to automatically predict the system requirements for edge node analytics in the Internet of Things (IoT). We envision that a flexible extensible system of edge analytics can be created for IoT management; however, edge nodes can be very different in terms of the systems requirements around: processing capability, wireless communication, security/cryptography, guaranteed responsiveness, guaranteed quality of service and on-board memory requirements. One of the challenges of managing a heterogeneous Internet of Things is determining the systems requirements at each edge node in the network.

We suggest exploiting opportunity of being able to automatically customize large scale IoT systems that could comprise heterogeneous edge nodes and allow a flexible and scalable component and firmware SoC systems to be matched to the individual need of enterprise/ government level IoT customers. We propose using large scale sequential decision learning algorithms, particularly contextual bandit modeling to automatically determine the systems requirements for edge analytics. These algorithms have an adaptive property that allows for the addition of new nodes and the re-evaluation of existing nodes under dynamic and potentially adversarial conditions.

SERPICO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Innopsys: Methods and algorithms for tissue microarrays image analysis

In collaboration with Magellium company and Institut Gustave Roussy, Innopsys plans to develop new image analysis software to be included in the INGRID platform developed by Megellium company. New statistical methods and algorithms will be investigated by SERPICO for:

- segmentation and detection of deformable cell contours and cell nuclei in 2D fluorescence tissue microarray images;
- deconvolution and superresolution of fluorescence microarray imaging.

The three-year contract supports the PhD thesis of Nam-Hoai Nguyen (2013-2016).

SHACRA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

InSimo is a startup we created in January 2013, after two years of thinking, maturation and incubation. Its founding members are all former or actual team members of SHACRA: Jeremie Allard, Juan Pablo de la Plata Alcalde and Pierre Jean Bensoussan have joined the operation team, while Stephane Cotin and Christian Duriez serve as scientific advisors. The business model of the company is based on the SOFA platform and its community to transfer state-of-the-art simulation technologies into commercially-supported software components that medical simulator vendors can integrate into their products. The goal is to foster the creation of a new generation of medical simulators, highly realistic, faster to develop, allowing a broader commercial offer and novel uses. InSimo participated to the 2012 OSEO / MESR national innovative technology company creation competition (Emergence category) and was selected as the best project in the Alsace region as well as one of the three projects highlighted at the national level. InSimo also won the HelpMeSee contract (in partnership with Moog and SenseGraphics) and entered in February 2013 into a 3-year development phase to build a first batch of 100 MSICS simulators.

7.2. Bilateral Grants with Industry

We have started a collaboration with INSERM - UMR-S 867 (minimal invasive and robotized otological surgery) Faculté de Médecine Paris Diderot Paris 7 and with the company Collin SA (Bagneux, France) which is developing some activities in the domain of the head and neck (surgical robot such as RobOtol, middle ear implants, surgical instruments, surgical navigation, ...). The objective of this project is to obtain a simulation tool applied to the ear surgery for both training and planning of conventional and robotized middle ear surgery. In addition, the aim of this work is to provide a tool able to explore, develop and assess new robotized procedures using a tele-operated device called RobOtol. Guillaume Kazmitcheff is doing his PhD in the context of this collaboration: he is paid by a CIFRE contract with Collin, he is mainly working with the INSERM team but the design of the simulation is done in collaboration with our group and he is enrolled in the university of Lille 1.

SIERRA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Technicolor: “Tensor factorization algorithms for recommendation systems”.
- Xerox: CIFRE PhD student “IMAGE2TXT: From images to text”.
- Microsoft Research: “Structured Large-Scale Machine Learning”. Machine learning is now ubiquitous in industry, science, engineering, and personal life. While early successes were obtained by applying off-the-shelf techniques, there are two main challeges faced by machine learning in the “ big data” era : structure and scale. The project proposes to explore three axes, from theoretical, algorithmic and practical perspectives: (1) large-scale convex optimization, (2) large-scale combinatorial optimization and (3) sequential decision making for structured data. The project involves two Inria sites (Paris-Rocquencourt and Grenoble) and four MSR sites (Cambridge, New England, Redmond, New York).

7.2. Bilateral Grants with Industry

- Google Research Award: “Large scale adaptive machine learning with finite data sets”

SIMPAF Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Study of the EKINOX model of corrosion (CNRS Contract with CEA, Univ Lille1, Univ B. Pascal)

Participants: Claire Chainais-Hillairet, Antoine Gloria.

In collaboration with C.Desgranges and F. Lequien (CEA), F. Bouchon (Univ. B. Pascal), A. Gloria and C. Chainais-Hillairet are considering the model EKINOX developed at CEA for the study of the corrosion of Ni-base alloys in PWR primary water. Starting from this numerical model (leading to an explicit in time scheme), they have established a macroscopic model (a system of coupled partial differential equations). Based on this model, they have proposed a new numerical method based on an implicit discretization of the diffusion terms.

7.2. Numerical methods for the DPCM model (Inria/ANDRA Contract)

Participants: Claire Chainais-Hillairet, Thomas Gallouët, Antoine Gloria.

During his post-doc, Thomas Gallouët is working on the numerical approximation of the DPCM model, see [31]. He has designed a new scheme for the direct computation of a steady-state. This scheme has been implemented in the code CALIPSO developed at ANDRA. Validation is in progress, as the numerical analysis of the scheme. Further work will also be done in order to introduce in the code CALIPSO a second order in time scheme which remain unconditionally stable. This is work in collaboration with C. Bataillon (CEA), F. Bouchon (Univ B. Pascal) and J. Fuhrmann (WIAS Berlin).

SIROCCO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Contract with Astrium on compression of satellite images

Participants: Jeremy Aghaei Mazaheri, Christine Guillemot, Claude Labit.

- Title : Compression of satellite images.
- Research axis : § 6.3.3 .
- Partners : Astrium, Inria-Rennes.
- Funding : Astrium.
- Period : Oct.11-Sept.14.

This contract with Astrium addresses the problem of sparse representation and dictionary learning for efficient sparse coding of video signals captured from a geostationary satellite. The goal is to develop a compact spatio-temporal representation taking advantage of the high redundancy present in the video which is of very high resolution and characterized by low motion. Different methods for learning tree-structured dictionaries have been studied. The tree-structured dictionaries are well-tailored to the characteristics of the signals to be processed at each iteration of the greedy matching pursuit algorithms, while allowing efficient encoding of the produced sparse vectors. Adaptive tree-structures have been developed and the use of such dictionaries in HEVC-based intra coding has been investigated. First tests have also been carried out to known to which extent the learned dictionnaries can allow detecting the modulation transfer function (MTF) used to characterize the quality of electro-optical imaging systems on board remote sensing satellites.

7.1.2. Collaboration with Alcatel on robust video compression

Participants: Marco Bevilacqua, Christine Guillemot, Ronan Le Boulch, Aline Roumy.

- Title: Self adaptive video codec
- Research axis: 6.2.3
- Funding: Joint research laboratory between Inria and Alcatel
- Period: Oct. 2010 - Dec. 2013.

In the framework of the joint research lab between Alcatel-Lucent and Inria, we participate in the ADR (action de recherche) Selfnets (or Self optimizing wireless networks). The objective is, jointly with the Alcatel Lucent team, to develop video representations and compression tools allowing smooth network adaptation on one hand and loss resilience on the other hand. In that context, the PhD thesis of M. Bevilacqua focuses on the development and study of image and video super-resolution as a tool for constructing scalable representations, hence enabling network adaptation of transmitted video streams. Single-image super-resolution algorithms have been developed, using different methods (neighbor embedding, local learning with regression), and dictionaries learned from external training images or learned on a multi-resolution pyramid constructed from the input low resolution image. These methods have been extended to video super-resolution, the dictionary being constructed from key frames.

7.1.3. Contract with EutelSat on video traffic analysis

Participants: Laurent Guillo, Aline Roumy.

- Title : Bit rate statistical analysis of HEVC encoded video in a broadcast transmission.
- Partners : EutelSat, Inria-Rennes.
- Funding : EutelSat.
- Period : Aug.12-Feb.13.

This contract with EutelSat (starting in August 2012) is a consulting contract and aims at analyzing the variation of the video traffic, when the video is encoded by HEVC. Indeed, the main characteristic of satellite broadcasting, as proposed by Eutelsat, is to provide a nearly constant video quality, which is obtained by variable video traffic (bit rate). Then, to address this variability issue, statistical multiplexing is used to share the resource among the users. However, statistical multiplexing needs a precise analysis of this variability. In this contract, we therefore analyze this variability, when the video is compressed with the upcoming video compression standard HEVC.

7.1.4. Contract with SHOM (Service Hydrographique et Océanographique de la Marine)

Participants: Alan Bourasseau, Olivier Le Meur.

- Title: Oceanograhic data compression
- Partners: SHOM, Alyotech, Univ. Rennes 1
- Funding: SHOM
- Period: 09/2012-02/2013.

The project consists in developing lossless and lossy compression algorithms for oceanographic data in partnership with ALYOTECH. The SIROCCO team contributes on the design and development of compression algorithms for this specific type of data, based on diffusion methods. The main constraint is the limited bandwidth used by the navy to transmit the data, i.e. an emitted message must be smaller than 4 kilo bytes. In 2013, the obtained quality versus rate performances has been assessed against those given by state of the art solutions (HEVC-Intra and JPEG-2000).

7.2. Grants with Industry

7.2.1. CIFRE contract with Orange on Generalized lifting for video compression

Participants: Christine Guillemot, Bihong Huang.

- Title : Generalized lifting for video compression.
- Research axis : § 6.3.5 .
- Partners : Orange Labs, Inria-Rennes, UPC-Barcelona.
- Funding : Orange Labs.
- Period : Apr.2012-Mar.2015.

This contract with Orange labs. (started in April. 2012) concerns the PhD of Bihong Huang and aims at modelling the redundancy which remains in spatial and temporal prediction residues. The analysis carried out in the first year of the PhD has shown that this redundancy (hence the potential rate saving) is high. In 2013, different methods have been investigated to remove this redundancy, such as generalized lifting and different types of predictors. The generalized lifting is an extension of the lifting scheme of classical wavelet transforms which permits the creation of nonlinear and signal probability density function (pdf) dependent and adaptive transforms. This study is also carried out in collaboration with UPC (Prof. Philippe Salembier) in Barcelona.

7.2.2. CIFRE contract with Orange on 3D quality assessment

Participants: Darya Khaustova, Olivier Le Meur.

- Title : Objective Evaluation of 3D Video Quality.
- Research axis : § 6.1.3 .
- Partners : Orange Labs, Inria-Rennes.
- Funding : Orange Labs.
- Period : Dec.2011-Nov.2014.

This contract with Orange labs. (starting in Dec. 2011) concerns the PhD of Darya Khaustova and aims at developping a video quality metric for 3D content. The usage of 3D video is expected to increase in the next years. In order to ensure a good QoE (Quality of Experience), the 3D video quality must be monitored and accuratly measured. The goal of this thesis is to study objective measures suitable for estimating 3D video quality. A comparison with ground truth as well as with the state-of-the-art 2D metrics should be carried out. To be as effective as possible, the feature of the human visual system should be taken into account.

7.2.3. CIFRE contract with Technicolor on High Dynamic Range (HDR) video compression

Participants: Mikael Le Pendu, Christine Guillemot.

- Title : Floating point high dynamic range (HDR) video compression
- Research axis : § 6.3.4 .
- Partners : Technicolor, Inria-Rennes.
- Funding : Technicolor, ANRT.
- Period : Dec.2012-Nov.2015.

High Dynamic Range (HDR) images contain more intensity levels than traditional image formats, leading to higher volumes of data. HDR images can represent more accurately the range of intensity levels found in real scenes, from direct sunlight to faint starlight. The goal of the thesis is to design a visually lossless compression algorithm for HDR floating-point imaging data. The first year of the thesis has been dedicated to the design of a quantization method converting the floating point data into a reduced bit depth representation, with minimal loss. The method leads to a bit rate saving of 50% compared to the existing Adaptive LogLuv transform.

7.2.4. CIFRE contract with Technicolor on sparse modelling of spatio-temporal scenes

Participants: Martin Alain, Christine Guillemot.

- Title : Spatio-temporal analysis and characterization of video scenes
- Research axis : § 6.1.4 .
- Partners : Technicolor, Inria-Rennes.
- Funding : Technicolor, ANRT.
- Period : Oct.2012-Sept.2015.

A first CIFRE contract has concerned the Ph.D of Safa Cherigui from Nov.2009 to Oct.2012, in collaboration with Dominique Thoreau (Technicolor). The objective was to investigate texture and video scene characterization using models based on sparse and data dimensionality reduction techniques, as well as based on epitomes. The objective was then to use these models and methods in different image processing problems focusing in particular on video compression. While, the first PhD thesis has focused on spatial analysis, processing, and prediction of image texture, a second CIFRE contract (PhD thesis of Martin Alain) has started in Oct. 2012 to push further the study by addressing issues of spatio-temporal analysis and epitome construction, with applications to temporal prediction, as well as to other video processing problems such as denoising and super-resolution.

7.2.5. CIFRE contract with Thomson Video Networks (TVN) on Video analysis for HEVC based video coding

Participants: Nicolas Dhollande, Christine Guillemot, Olivier Le Meur.

- Title : Coding optimization of HEVC by using pre-analysis approaches.
- Research axis : § 6.3.5 .
- Partners : Thomson Video Networks, Univ. Rennes 1.
- Funding : Thomson Video Networks (TVN).
- Period : Nov.2012-Sept.2015.

This contract with TVN (started in Oct. 2012) concerns the PhD of Nicolas Dhollande and aims at performing a coding mode analysis and developing a pre-analysis software. HEVC standard is a new standard of compression including new tools such as advanced prediction modes. Compared to the previous standard H.264, HEVC's complexity is three to four times higher. The goal of this thesis is to infer the best coding decisions (prediction modes...) in order to reduce the computational complexity of HEVC thanks to a pre-analysis step. The pre-analysis is expected to provide useful estimates of local video characteristics which will then help selecting the prediction and transform partitions as well as a number of other parameters such as the quantization parameters or the prediction modes.

SISYPHE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. CGAO_v2 contract: glycemic control system

Participants: Alexandre Guerrini, Michel Sorine.

Our work on glycaemic control done in the framework of the CIFRE contract of A. Guerrini [31] with LK2 (Tours, France), has led to develop an improved controller, CGAO_v2 (see Sections 4.3 and 5.3). This year, our rights on CGAO_v2 have been sold to LK2 which has packaged it with a user interface in a system used by Fresenius-Kabi in their control software *master GC*.

7.2. SciWorks Technologies contract: development of K-Assessor

Participants: Habib Jreige, Michel Sorine.

The development and a first application of K-Assessor (see Section 5.6) has been done with SciWorks Technologies: risk analysis for *master GC*, a software of Fresenius-Kabi dedicated to glycemic control assistance based on the control algorithm CGAO_v2 (see Section 5.3).

SMIS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

The SMIS project has a long lasting cooperation with Gemalto, the world's leading providers of microprocessor cards. Gemalto provides SMIS with advanced hardware and software smart card platforms which are used to validate numbers of our research results. In return, SMIS provides Gemalto with requirements and technical feedbacks that help them adapting their future platforms towards data intensive applications. While no bilateral contract exists between Gemalto and SMIS, we are partners in several projects. Meanwhile, we are developing partnerships with SMEs capable of building ad-hoc hardware prototypes conforming to our own design.

7.2. DMSP3 Yvelines District Grant (Nov 2013 - Nov. 2014)

Partners: Inria-SMIS (coordinator), Gemalto, UVSQ, Santeos.
SMIS funding: 75k€.
http://www-smis.inria.fr/_DMSP/accueil.php

Electronic Health Record (EHR) projects have been launched in most developed countries to increase the quality of care while decreasing its cost. Despite their unquestionable benefits, patients are reluctant to abandon their control of highly sensitive data to a distant server. The objective of the DMSP project is to complement a traditional EHR server with a secure and mobile personal medical folder (1) to protect and share highly sensitive data among trusted parties and (2) to provide a seamless access to the data even in disconnected mode. The DMSP architecture builds upon the technology designed in the PlugDB project (see above). This architecture has been designed and developed under grant DMSP1 ended in 2010. It has been experimented in the context of a medical-social network providing care and services at home for elderly people. The experiment in the field, founded by grant DMSP2, lasted from September 2011 to December 2012 with volunteer patients and practitioners in the Yvelines district. The goal of grant DMSP3 (Nov 2013 - Nov 2014) is to correct the imperfections observed during DMSP2 and port our prototype in an open hardware platform with the final objective to set up a technology transfer.

SOCRATE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Socrate has strong collaborations with Orange Labs (point to point collaboration) and Alcatel Lucent through the Inria-ALU common lab and the Green Touch initiative. Socrate also works in collaboration with Siradel, a french worldwide company working on wireless system simulations, Sigfox a young french compagny deploying the first cellular network operator dedicated to M2M and IoT, and HIKOB a start-up originated from the Citi laboratory providing sensor networks solutions. A bilateral cooperation supports the PhD of Laurent Maviel, and Siradel is a member of the Ecoscell ANR project in which Socrate is involved.

Socrate started in September 2011 a strong bilateral cooperation with the Euromedia group about Body Area Networks in which Tanguy Risset, Guillaume Villemaud and Jean-Marie Gorce are involved and the project supports the thesis of Matthieu Lauzier.

A collaboration started in 2013 with Bosch on arithmetic for automotive embedded platforms. It involves Florent de Dinechin and members of the AriC team.

Florent de Dinechin received a donation of two ZedBoard platforms from the Xilinx University Program.

SPADES Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- With ST Microelectronics: CIFRE contract for the PhD of Vagelis Bebelis. This work is described in Section 6.2.6 .
- With ARGOSIM SA: “Study and transfer contract” for the development by Bertrand Jeannet and the cession to ARGOSIM of the PolyCart library. PolyCart is a library for the manipulation of cartesian products of polyhedra and intervals.

Specfun Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

The team is involved in two Common Research Agreements in the MSR–INRIA Joint Centre:

- *DDMF (Dynamic Dictionary of Mathematical Functions)*.
  Goal: Automate exact computations of the mathematical formulas on the special functions of mathematical analysis and present them on an interactive mathematical dictionary online.
  Leader: F. Chyzak. Participants: A. Bostan, P. Lairez.
  Website: http://ddmf.msr-inria.inria.fr/.
- *Mathematical Components*.
  Goal: Investigate the design of large-scale, modular and reusable libraries of formalized mathematics. Developed using the Coq proof assistant. This project successfully formalized the proof of the Odd Order Theorem, resulting in a corpus of libraries related to various areas of algebra.
  Leader: G. Gonthier (MSR Cambridge). Participants: A. Mahboubi, E. Tassi.
  Website: http://www.msr-inria.fr/projects/mathematical-components/.

STARS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- **Toyota europ**: this project with Toyota runs from the 1st of August 2013 up to 2017 (4 years). It aims at detecting critical situations in the daily life of older adults living home alone. We believe that a system that is able to detect potentially dangerous situations will give peace of mind to frail older people as well as to their caregivers. This will require not only recognition of ADLs but also an evaluation of the way and timing in which they are being carried out. The system we want to develop is intended to help them and their relatives to feel more comfortable because they know potentially dangerous situations will be detected and reported to caregivers if necessary. The system is intended to work with a Partner Robot (to send real-time information to the robot) to better interact with the older adult.
- **LinkCareServices**: this project with Link Care Services runs from 2010 upto 2014. It aims at designing a novel system for Fall Detection.This study consists in evaluating the performance of video-based systems for Fall Detection in a large variety of situations. Another goal is to design a novel approach base on RGBD sensors with very low rate of false alarms.

STEEP Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

The PhD thesis of Jean-Yves Courtonne is co-sponsored by ARTELIA and Inria, via a bilateral contract.

Related to the former computer vision research activities of team members, we still had three contracts with EADS Astrium Satellites, where we appear as sub-contractors for one national and two European projects: DECSA (DGA), MREP Camera (European Space Agency), TRP-FUSION (European Space Agency).

SUMO Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

HiMa. The SUMO team was involved in the common research lab between Alcatel-Lucent Bell Labs France and Inria, through the High-Manageability team, co-headed by Pierre Peloso (Alcatel) and Éric Fabre. This joint team involved other Inria teams: Madynes and Mexico. In the last years of its existence, most of the activity of this joint team was redirected to the UniverSelf FP7 integrated project. Both the joint team and the project ended in 2013 (see the UniverSelf description for more details). This joint team supported two PhD students of SUMO, who defended their thesis in 2013: Aurore Junier (network calculus for early malfunction detection) and Carole Hounkonnou (self-diagnosis for large scale services and networks). Éric Fabre is member of the scientific board of the joint lab ALBLF-Inria, which is now entering in its second round of 5 year common teams.

TAO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Thalès Air Systems (corr. Areski Hadjaz), related to Gaétan Marceau-Caron's CIFRE PhD, May 2011 - May 2014, 15kEuros per year.
- Modyrum (*Modélisation Dynamique d'un Réseau Médiatique*, related to Marco Bressan's postdoc), SME Augure, started Feb. 2013, 150kEuros.

  Participants: Marco Bressan, Cyril Furtlehner, Michèle Sebag.
- I-Lab METIS (*A general framework for decision making with uncertainty plus energy-specific applications*, related to Jérémie Decock's PhD, ARTELYS-Inria, Sept.2011 - Aug.2014, 40kEuros.

  Participants: Jérémie Decock, Jean-Joseph Christophe, Olivier Teytaud.

TASC Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Ligéro(AGIRA)

Participants: Xavier Lorca, Thierry Petit.

Title: Ligéro.

Duration: 2013.

Type: Regional research group

Teaching optimization project.

7.2. CPER

Participant: Charles Prud'Homme.

Title: CPER.

Duration: 2010-2014.

Type: Regional research group.

Budget: 250000 Euros.

Others partners: EMN (team ATLANMOD), EMN (team ASCOLA), IRCCyN (team SLP).

Develop, promote and build up an eco-system around free software in the Pays de la Loire region. The TASC team is involved in the maintenance and development of the free constraint programming platform CHOCO.

7.3. UNIT

Participants: Nicolas Beldiceanu, Eliane Vacheret.

Title: UNIT.

Duration: 2011-2013.

Type: Developing teaching material.

Budget: 5000 Euros.

Others partners: EMN (CAPE).

Pedagogical material and software for learning constraints programming for non experts (integrated within the global constraint catalog). The course will be available on line in spring 2014.

7.4. FUI SUSTAINS

Participants: Charlotte Truchet, Bruno Belin.

Title: SUSTAINS.

Duration: 2010-2015.

Type: FUI.

Budget: 151400 Euros.

Others partners: Artefacto, Artelys, Areva TA, EPAMarne, LIMSI.

The SUSTAINS project (*Constraint-based Prototyping of Urban Environments*) aims at building decision support system for city development planning with evaluation of energy impacts. The project is focussed on spatial allocation of typical units such as industrial areas, commercial areas and leaving areas with their respective appropriate infrastructure. Its integrates sustainability, transport and energy concerns.

7.5. ANR BOOLE

Participants: Vincent Armant, Jérémie Du Boisberranger, Xavier Lorca, Charlotte Truchet.

Title: BOOLE.

Duration: 2010-2013.

Type: open research program.

Budget: founding a PhD student and travels.

Others partners: Univ. de Versailles Saint-Quentin, Univ. Caen, Univ. Paris 8, Univ. Aix-Marseille, Univ. Paris Nord, Univ. Paris 11, ENS Paris.

Défi: Probabilistic method for combinatorial problems.

The work of TASC focuses on the use of probabilistic methods to avoid waking systematically global constraints for nothing. The goal is to provide probabilistic models for the consistency of global constraints such as *alldifferent* or *nvalue*. We compute the probability of a constraint to be still consistent after fixing one of its variables and provide an approximation that can be computed in constant time. The PhD of J. du Boisberranger is co-supervised with D. Gardy from Univ. de Versailles Saint-Quentin.

7.6. ANR NetWMS2

Participants: Nicolas Beldiceanu, Gilles Chabert.

Title: Networked Warehouse Management Systems 2: packing with complex shapes.

Duration: 2011-2014.

Type: cosinus research program.

Budget: 189909 Euros.

Others partners: KLS Optim and CONTRAINTES (Inria Rocquencourt).

This project builds on the former European FP6 Net-WMS Strep project that has shown that constraint-based optimisation techniques can considerably improve industrial practice for box packing problems, while identifying hard instances that cannot be solved optimally, especially in industrial 3D packing problems with rotations, the needs for dealing with more complex shapes (e.g. wheels, silencers) involving continuous values. This project aims at generalizing the geometric kernel *geost* for handling non-overlapping constraints for complex two and three dimensional curved shapes as well as domain specific heuristics. This will be done within the continuous solver IBEX, where discrete variables will be added for handling polymorphism (i.e., the fact that an object can take one shape out of a finite set of given shapes). In 2013 a filtering algorithm has been devised in the case of objects described by nonlinear inequalities and is now under testing with the Ibex library. This work has been presented in a workshop on interval methods & geometry in ENSTA Bretagne.

7.7. ANR INFRA-JVM

Participants: Xavier Lorca, Charles Prud'Homme.

Title: Towards a Java Virtual Machine for pervasive computing.

Duration: 2011-2013.

Type: **new project**.

Budget: 78000 Euros.

Others partners: Univ. Paris 6 (REGAL team), LaBRI (LSR team), IRISA (TRISKELL).

The INFRA-JVM project will investigate how to enhance the design of Java virtual machines with new functionalities to better manage resources, namely resource reservation, scheduling policies, and resource optimization at the middleware level. TASC is concerned with this later aspect. The performance of CHOCO will be improved using the memory snapshot mechanism that will be developed.

7.8. EDF

Participants: Nicolas Beldiceanu, Helmut Simonis.

Within the context of the Gaspard Monge call program for Optimisation and Operation Research we work with EDF on the research initiative on *Optimization and Energy*. The goal of the project (continuation of last year project) is first to extract constraints from daily energy production temporal series issued from the 350 production plants of EDF, second to see how to use these constraints in order to reduce the combinatorial aspect of the daily production planning solving process. The work is based on the CP 2012 model seeker.

7.9. LabCom

Participants: Charles Prud'Homme, Xavier Lorca.

Title: TransOp.

Duration: 2014-2016.

Type: **new project**.

Budget: 300000 Euros.

Others partners: Eurodécision.

The goal of the project is to handle robustness in the context of industrial timetabling problems with constraint programming using CHOCO.

7.10. PHC Ulysses

Participants: Charlotte Truchet, Florian Richoux, Alejandro Reyes.

Title: Development and estimation analysis of massively parallel local search approaches to the k-medoids problem.

Duration: 2014.

Type: **new project**.

Budget: 2500 Euros.

Others partners: 4C (Cork, Ireland).

The goal of this project is to develop parallel local search techniques for solving large instances of the k-medoids problem, a location problem with several applications, in particular in optical fiber networks deployment.

7.11. ECOS Sud

Participant: Eric Monfroy.

Title: Auto-Evol (Autonomous Evolutionary Algorithms).

Duration: 2011-2013.

Budget: 15 KEuros per year for the project.

Others partners: LERIA (Angers, France), Univ. Austral de Chile (Chili), UTFSM (Valparaiso, Chili).

TEXMEX Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

- CIFRE Ph. D. thesis of Ludivine Kuznik with Institut National de l'Audiovisuel
- CIFRE Ph. D. thesis of Bingqing Qu with Institut National de l'Audiovisuel
- CIFRE Ph. D. thesis of Mohamed-Haykel Boukadida with Orange Labs
- CIFRE Ph. D. thesis of Cédric Penet with Technicolor

TITANE Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Astrium

Participants: Sven Oesau, Florent Lafarge, Pierre Alliez.

The main goal of this collaboration is to devise new algorithms for reconstructing 3D indoor models that are more accurate, meaningful and complete than existing methods. The conventional way for modeling indoor scenes is based on plane arrangements. This type of representation is particularly limited and must be improved by devising more complex geometric entities adapted to a detailed and semantized description of scenes.

- Starting date: April 2012

- Duration: 3 years

7.1.2. Geoimage

Participants: Liuyun Duan, Florent Lafarge, Pierre Alliez.

The aim of this collaboration is to devise a new type of 2.5D representation from satellite multi-view stereo images which is more accurate, compact and meaningful than the conventional DEMs. A key direction consists in incorporating semantic information directly during the image matching process. This semantic is related to the type of components of the scene, such as vegetation, roofs, building edges, roads and land.

- Starting date: November 2013

- Duration: 3 years

7.1.3. Technicolor

Participants: Xavier Rolland-Neviere, Pierre Alliez.

The goal of this Cifre Ph.D. thesis project is to devise a method for watermarking 3D models, with resilience to a wide range of attacks and poses.

- Starting date: October 2012

- Duration: 3 years

...

TOCCATA Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. CIFRE contract with Adacore

Participants: Claude Marché [contact], Andrei Paskevich, Claire Dross.

Jointly with the thesis of C. Dross, supervised in collaboration with the Adacore company, we established a bilateral collaboration contract, that started in January 2012 for 3 years.

The aim is to strengthen the usability of the *Alt-Ergo* theorem prover in the context of the GnatProve environment for the verification of safety-critical Ada programs [85]. A focus is made on programs involving Ada containers [86].

7.2. Bilateral Grants with Industry

7.2.1. Intel Grant

Participants: Sylvain Conchon [contact], Alain Mebsout.

S. Conchon has obtained an academic grant by Intel corporation on the development of the Cubicle model checker. The goal of this project was to develop a new version of Cubicle with significantly improved model-checking power. This required innovative algorithmic enhancements to be implemented and evaluated.

TOSCA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- TOSCA Nancy had a bilateral contract with the SME Alphability on the evaluation of the Value at Risk with applications in portfolio management. This collaboration will be continued in 2014.

7.2. Bilateral Grants with Industry

- Since September 2013, TOSCA Sophia is involved in a Cifre convention with Koris International.

7.3. Promotion of Mathematics in the industry

- D. Talay is the Vice-President of the Fondation d'Entreprise Natixis which aims to contribute to develop research in quantitative finance. He also serves as a member of the Scientific Committee of the Foundation.
- D. Talay is a member of the Scientific Committee of the AMIES National Agency aimed to promote interactions between Mathematics and Industry.

TRIO Team (section vide)

TRISKELL Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. VaryMDE

Participants: Benoit Combemale, Olivier Barais, Mathieu Acher, Jean-Marc Jézéquel, João Bosco Ferreira Filho, Suresh Pillay, David Mendez Acuna.

MDE, Variability Management, Software Language Engineering.

This bilateral collaboration is between the Triskell team and the MDE lab at Thales Research & Technology. This partnership explores variability management both in modeling and metamodeling (i.e., design and implementation of software languages), and enrolls 4 faculty members and 2 PhD students from the Triskell team. This year, we keep working on the CVL usage in the Thales context.

Project duration: 2011-2014

Triskell budget share: 284 keuros

7.2. Sodifrance

Participants: Emmanuelle Rouillé, Benoit Combemale, Olivier Barais, Jean-Marc Jézéquel.

Software Process, Intentional-Driven Development, Process Execution

Since October 2010, we have a collaboration with Sodifrance, Rennes. In this project we investigate the support (capitalization, definition, execution, and adaptation) of software processes in the context of model driven development (MDD). The purpose of this work is twofold:

- automate the tool configuration and the dynamic adaptation of MDD CASE tools.
- support an automated verification of models, according to the requirements for each activity of the process.

In this context, Jean-Marc Jézéquel acts as Ph.D advisor for Emmanuelle Rouillé, also supervised by Benoit Combemale and Olivier Barais.

Project duration: 2010-2013

Triskell budget share: 25 keuros

7.3. Zenexity

Participants: Julien Richard-Foy, Olivier Barais, Jean-Marc Jézéquel.

Web engineering, Domain Specific Languages

In this project with the Zenexity company we investigate the new architecture model for efficient web development on top of the play framework (a web framework developed by Zenexity).

In this context, Jean-Marc Jézéquel and Olivier Barais act as Ph.D advisor for Julien Richard Foy.

Project duration: 2011-2014

Triskell budget share: 20 keuros

7.4. Technology transfer

Since mid 2011 the Triskell team is designing and implementing the DAUM platform that integrates a large range of technologies, ranging from wireless low cost sensors to clouds made of rugged field miniservers. Our application use case is a tactical decision system designed in cooperation with a large firefighter department of 3,500 firefighters. This platform is being used as a real life testbed for our results on dynamic, continuous design of distributed pervasive systems. It is also used as a concrete cooperation support within the Marie Curie Initial Training Network *Relate*.

By combining *models@runtime* techniques and component-based techniques, we have shown how we can apply model driven engineering to design large-scale, distributed, heterogeneous and adaptive systems.

Until october 2013 the DAUM platform was funded by an Inria Technology Development activity. In 2013 Triskell was granted for a specific funding (one year of engineer salary) to prepare the transfer of DAUM to the industry and prepare the creation of a startup focused on tools and applications for tactical information and decision systems on the field. The startup planned will involve seven members of the Triskell team.

TYREX Team (section vide)

URBANET Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

- A new bilateral collaboration between Orange Labs and Inria UrbaNet started on July 2013. For 3 years, we will investigate how to adapt service level agreements (SLA) concept to wireless sensor networks. The goal is to share a WSN infrastructure to several clients and applications. This approach is quite new because related work mainly view WSN as a data-centric architecture dedicated for only one application. We extend this limitation, and during this work, we aim at building a telecommunication operator point of view in WSN.

VEGAS Project-Team (section vide)

VERIDIS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Project funded by EADS Foundation

Participants: Jingshu Chen, Marie Duflot-Kremer, Pascal Fontaine, Stephan Merz.

This two-year project (2013/2014) funds our work on the analysis of real-time Java programs described in section 6.2 , and in particular 12 months of the salary of Jingshu Chen as a post-doctoral researcher. It is complemented by funds granted by Région Lorraine.

VIRTUAL PLANTS Project-Team (section vide)

VISAGES Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Siemens

duration: 5 years from 2011/10/26

In the context of the Neurinfo imaging platform, a partnership between Siemens SAS - Healthcare and University of Rennes 1 was signed in October 2011 for 5 years. This contract defines the terms of the collaboration between Siemens and the Neurinfo platform. The Neurinfo platform has received work in progress (WIP) sequences from Siemens in the form of object code for evaluation in the context of clinical research. The Neurinfo platform has also received source code of selected MRI sequences. This a major advance in the collaboration since it will enable the development of MRI sequences on site.

WILLOW Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. EADS (ENS)

Participants: Jean Ponce, Josef Sivic, Andrew Zisserman.

The WILLOW team has had collaboration efforts with EADS via tutorial presentations and discussions with A. Zisserman, J. Sivic and J. Ponce at EADS and ENS, and submitting joint grant proposals. In addition, Marc Sturzel (EADS) is doing a PhD at ENS with Jean Ponce and Andrew Zisserman.

7.2. MSR-Inria joint lab: Image and video mining for science and humanities (Inria)

Participants: Leon Bottou [MSR], Ivan Laptev, Maxime Oquab, Jean Ponce, Josef Sivic, Cordelia Schmid [Inria Lear].

This collaborative project brings together the WILLOW and LEAR project-teams with MSR researchers in Cambridge and elsewhere. The concept builds on several ideas articulated in the “2020 Science” report, including the importance of data mining and machine learning in computational science. Rather than focusing only on natural sciences, however, we propose here to expand the breadth of e-science to include humanities and social sciences. The project we propose will focus on fundamental computer science research in computer vision and machine learning, and its application to archaeology, cultural heritage preservation, environmental science, and sociology, and it will be validated by collaborations with researchers and practitioners in these fields.

In October 2013 a new agreement has been signed for 2013-2016 with the research focus on automatic understanding of dynamic video content. Recent studies predict that by 2014 video will account for more than 90% of traffic on the Internet. Automatic understanding and interpretation of video content is a key enabling factor for a range of practical applications such as organizing and searching home videos or content aware video advertising. For example, interpreting videos of “making a birthday cake" or “planting a tree" could provide effective means for advertising products in local grocery stores or garden centers. The goal of this project is to perform fundamental computer science research in computer vision and machine learning in order to enhance the current capabilities to automatically understand, search and organize dynamic video content.

7.3. Google: Learning to annotate videos from movie scripts (Inria)

Participants: Josef Sivic, Ivan Laptev, Jean Ponce.

The goal of this project is to automatically generate annotations of complex dynamic events in video. We wish to deal with events involving multiple people interacting with each other, objects and the scene, for example people at a party in a house. The goal is to generate structured annotations going beyond simple text tags. Examples include entire text sentences describing the video content as well as bounding boxes or segmentations spatially and temporally localizing the described objects and people in video. This is an extremely challenging task due to large intra-class variation of human actions. We propose to learn joint video and text representations enabling such annotation capabilities from feature length movies with coarsely aligned shooting scripts. Building on our previous work in this area, we aim to develop structured representations of video and associated text enabling to reason both spatially and temporally about scenes, objects and people as well as their interactions. Automatic understanding and interpretation of video content is a key-enabling factor for a range of practical applications such as content-aware advertising or search. Novel video and text representations are needed to enable breakthrough in this area.

WIMMICS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Alcatel Lucent Bell Labs

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

7.2. SAP

We have a PhD Thesis (Cifre) with SAP Research on *Usage semantics of analytics and Business Intelligence tools*.

7.3. SynchroNext

Catherine Faron Zucker, Elena Cabrio and Fabien Gandon constructed a scientific collaboration project with the SynchroNext company which led to the acceptation of a CIFRE PhD Thesis by the ANR. Amine Hallili started his PhD Thesis in November 2013.

ZENITH Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Microsoft (2013-2017)

Participants: Ji Liu, Esther Pacitti, Patrick Valduriez.

This joint project is on advanced data storage and processing for cloud workflows with the Kerdata team in the context of the Joint Inria – Microsoft Research Centre. The project addresses the problem of advanced data storage and processing for supporting scientific workflows in the cloud. The goal is to design and implement a framework for the efficient processing of scientific workflows in clouds. The validation h will be performed using synthetic benchmarks and real-life applications from bioinformatics: first on the Grid5000 platform in a preliminary phase, then on the Microsoft Azure cloud environment.

7.2. EDF R&D (2013-2014)

Participants: Tristand Allard, Florent Masseglia, Esther Pacitti.

This project aims at developping new data mining techniques for P2P networks. The main goal is to preserve data privacy, while achieving good performance of analysis processes on the tackled data. More precisely, each participant in the P2P network has its own individual data (e.g. results of experiments for a scientific partner) and all the participants would like to acquire knowledge computed on the whole dataset (i.e. the union of all the individual data on the peers). Meanwhile, participants want a guarantee that no other participant will be able to see their data. The P2P protocol we are developping will then be able to extract knowledge from the whole set of distributed data, while avoiding centralization, and guaranteeing data privacy for all peers.