



RESEARCH CENTER

FIELD

Activity Report 2014

# Section Contracts and Grants with Industry

Edition: 2015-03-24



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**ABS Project-Team (section vide)**

## **ALF Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### **7.1.1. Intel research grant ALF-INTEL2014-8957**

**Participant:** André Seznec.

Intel is supporting the research of the ALF project-team on "Mixing branch and value prediction to enable high sequential 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 (PhD of Marion Baranes, employed at viavoo, which started in 2012 on automatic normalisation of noisy texts),
- Yseop (“CIFRE” PhD of Raphael Salmon which started in 2012 on automatic text generation)
- CEA-List (PhD of Quentin Pradet on the annotation of semantic roles in specific domains. The thesis has finished on the 12/31/2015 (defense on the 02/06/2015).
- Proxem (consulting)

**ALPINES Project-Team (section vide)**

**AMIB Project-Team (section vide)**

## **ANGE Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- SAUR (company which manages water supplies): ANGE was involved in a 24.000 euro–contract with the Inria project-team BIOCORE (Sophia-Antipolis). This project relies on the optimisation of hydrodynamics in a lagoon in order to depollute it.
- ADEME (national agency for environment and resource management): ANGE participated to a study upon the contribution of algae in the production of energy in France till 2030.
- La Compagnie du Vent (subsidiary of GDF-Suez): in the framework of the “Salinalgue” project aiming at reducing greenhouse gas emission, ANGE and BIOCORE carried out a study upon microalgae production (10.000 euros for each team).

## **7.2. Grants with Industry**

The PhD thesis of P. Ung is granted by CNRS, by AMIES (French agency for mathematics in interaction with companies and the society), by EDF 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.



## ANTIQUE Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. RTOS Contract

Title: Static Analysis of a Fragment of an Operating-System with **ASTRÉE**A

Type: Service contract

Duration: June 2014 - December 2014

Partners: École Normale Supérieure (France), CNRS (France), Airbus France (France)

Inria contact: Antoine Miné

Abstract: The aim of the contract is to study the formal verification of the safety of a fragment of a small real-time multi-task operating system. The verification will be performed using the **ASTRÉE**A analyzer, by adapting and extending the model of parallel executions developed at École Normale Supérieure.

## AOSTE Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. Kontron PhD CIFRE thesis

**Participants:** Mohamed Bergach, Robert de Simone.

Kontron Toulon (formerly Thales Computers) has a strong interest in finding optimal (or at least efficient) mapping of applications extensively based on FFT computations (mostly radar detection), onto GPGPU architectures of the Intel IvyBridge/Haswell family (that are then integrated into avionic subsystems at Kontron). This is the main topic of Mohamed Bergach PhD thesis, which should be defended in late Spring 2015. A publication is under submission.

### 7.1.2. Airbus PhD CIFRE thesis

**Participants:** Liliana Cucu-Grosjean, Cristian Maxim.

As part of a larger collaborative programme between Inria and Airbus, the PhD thesis of Cristian Maxim has started in March 2014. This thesis will propose a methodology for obtaining probabilistic worst-case execution times distributions by characterizing the appropriate properties of Airbus applications and platforms. This first year is dedicated to the familiarization of Cristian Maxim to the Airbus applications and platforms.

### 7.1.3. Astrium/CNES PostDoc

The objective of our collaboration with Airbus Defence and Space and the CNES is to determine how the design and implementation of embedded software and system/network configuration can be largely automated 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 application of such techniques also requires extensions at the level of system specification formalisms. This collaboration has funded the post-doctoral period of Raul Gorcitz (started in September 2013, reconducted for one year).

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## APICS Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Contract CNES-Inria-XLIM

This contract (reference Inria: 7066, CNES: 127 197/00) involving CNES, XLIM and Inria, focuses on the development of synthesis algorithms for  $N$ -ports microwave devices. The objective is to derive analytical procedures for the design of multiplexers and routers, as opposed to "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

This contract (reference CNES: RS14/TG-0001-019) involving CNES, University of Bilbao (UPV/EHU) and Inria aims at setting up a methodology for testing the stability of amplifying devices. The work at Inria is concerned with the design of frequency optimization techniques to identify the unstable part of the linearized response and analyze the linear periodic components.

## 7.3. Contract BESA GmbH-Inria

This is a research agreement between Inria (Apics and Athena teams) and the German company BESA <sup>0</sup>, which deals with head conductivity estimation and co-advising of the doctoral work of C. Papageorgakis, see Section 6.1.1 . BESA is funding half of the corresponding research grant, the other half is supported by Region PACA (BDO), see Section 8.1.1 .

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<sup>0</sup><http://www.besa.de/>

## ARAMIS Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. *Air-Liquide Medical Systems*

**Participants:** Mario Chavez [Correspondant], Xavier Navarro.

Project title: Real-time characterisation of respiratory states from EEG

Founded in 2014

Amount: 370 K€

Coordinator: Thomas Similowski

Other partners: UPMC, Inserm UMR 1158

Abstract: The project aims at developing a real-time brain computer interface (BCI) for the monitoring of respiratory states from scalp EEG data of healthy volunteers and patients, recorded at the laboratory, hospital ward, operating room or intensive care units..

## **ARIC Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### **7.1.1. *Contracts with Bosch.***

Two studies were conducted for Bosch (Stuttgart) on the numerical aspects of embedded computing. In the first one, Florent de Dinechin and Jean-Michel Muller dealt with the issue of the choice of an adequate representation of numbers (fixed-point or floating-point) for embedded systems. In the second one, Claude-Pierre Jeannerod reported on the stability and accuracy issues of linear system solving in finite-precision arithmetic.

### **7.1.2. *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. *Collaboration with Kalray.***

Nicolas Brunie has been supported by a CIFRE PhD grant (from 15/04/2011 to 14/04/2014) from Kalray. The purpose was the study of a tightly coupled reconfigurable accelerator to be embedded in the Kalray multicore processor.

### **7.2.2. *Orange Labs PhD Grant.***

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

## 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 Nov 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. CIFRE PhD Fellowships

### 6.1.1. 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.

### 6.1.2. Neurelec/Oticon Medical

The work of Thomas Demarcy, *Segmentation and anatomic variability of the cochlea and other temporal bone structures from medical images*, is supported by a PhD fellowship from the Neurelec/Oticon Medical company.

## 6.2. Inria - Mauna Kea Technologies I-Lab SIWA

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

*This I-lab involves the Mauna Kea Technologies company.*

The first focus of this I-lab is to develop efficient and friendly content-based image retrieval (CBIR) tools to help user to make a diagnosis. The resulting smart atlas has been published in 3 clinical [27], [28], [19] and one methodological [18] conferences. The second focus is on image registration to provide near real-time and robust image registration tools built on GPU implementations for image stabilization and super-resolution as it is a critical method for the smart atlas.

For more information, see <https://lisa.sophia.inria.fr/siwa-loasis-numerique-dinria-et-de-mauna-kea-706.html>.

## 6.3. Microsoft Research

Microsoft Research is funding through the Inria-Microsoft joint lab the projects "**4D Cardiac MR Images**" and "**Medilearn**" aiming at analyzing large databases of cardiac images to help the diagnosis of cardiac diseases and planning of therapy. This project involves A. Crimisi from MSR and partially funds the Phds of Loic Le Folgoc and Jan Margeta as well as the post doctoral stay of Hervé Lombaert.

## 6.4. Spin-off company Therapixel

**Therapixel** is a spin-off of the Asclepios (Inria Sophia Antipolis) and Parietal (Inria Saclay) project teams founded in 2013. Therapixel makes surgical information systems. 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. Therapixel obtained in 2014 the CE marking of its product on touchless visualization of medical images.

## 6.5. Other contracts

The contracts with Philips and Siemens are described in our previous activity reports.

## 6.6. National Initiatives

### 6.6.1. Consulting for Industry

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

### **6.6.2. Collaboration with national hospitals**

Asclepios is collaborating with the following 3 IHU (University Hospital Institute) in France : the IHU-Strasbourg (Pr J. Marescaux and L. Soler) on image-guided surgery (N. Ayache serves as Chief Scientific Officer), the IHU-Bordeaux (Pr M. Haïssaguere and Pr P. Jaïs) on cardiac imaging and modeling and the IHU-Pitié Salpêtrière (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 [correspondent], Simon Dupont.

In 2012, we have started a 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 rapidly growing in number and size and have to urgently face with energy consumption issues. 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 2014, we have performed real world evaluations within Sigma's data centers that validated the results on new techniques for the management of elasticity within Cloud applications [27]. We have also presented our current work at <sup>0</sup>.

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<sup>0</sup>GreenTouch @ Nantes Digital Week

## 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 , 4.2 and 5.3

*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 Kenné.

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 developed 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 developed by LSIS and Inria in a previous contract (Inria contract ALLOC 4233) with DGA / Techniques navales.

## **ATEAMS Project-Team**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. Bilateral Contracts with Industry**

- ING co-financed one PhD position in the context of CWI public-private collaboration program. The goal is to apply domain-specific language technology to revitalize core banking infrastructure.
- AimValley won the CWI research voucher for developing a DSL for state machines in the context of embedded devices. Davy Landman performed the research and development.

## ATHENA Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. 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 Kai Dang's 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.

## 7.2. PACA PhD contract with Olea Medical

**Participants:** Marco Pizzolato, Rachid Deriche.

**Title:** Diffusion & Perfusion MRI : From bench to bedside  
The objectives of Marco Pizzolato's 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.

## 7.3. 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 2013 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 most recent milestones added on the road-map includes higher order models such as ODFs, FODs, EAPs, etc. This is currently followed up by tractography algorithms – both deterministic and probabilistic.

## 7.4. BESA GmbH

**Participants:** Maureen Clerc, Théodore Papadopoulo, Juliette Leblond [APICS], Christos Papageorgakis.

We are collaborating with the BESA company (Brain Electromagnetic Source Analysis) on modeling head tissue conductivity, and on forward and inverse problems of source localization. The PhD thesis of C. Papageorgakis, 50% funded by BESA, started in October 2014.

**ATLANMOD Project-Team (section vide)**

## **AVALON Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### **7.1.1. Animerique**

One of the goals of the CapRézo company is to provide an original tool to make 2D/3D animation films. This tool is an innovative and distributed numerical platform. This platform is built on software developed by Avalon like DIET. Technologies developed in collaboration between CapRézo and Inria are based on Cloud federation environment. The collaboration, started in 2014, is scheduled for the next 5 years.

## **7.2. Bilateral Grants with Industry**

### **7.2.1. NewGeneration-SR**

We have a collaboration with the company NewGeneration-SR. The aim of this company is to reduce the energy impact through solutions on each layer of the energy consumption (from the data-center design and the production to usage). NewGeneration-SR improve the life cycle (design, production, recycling) in order to reduce the environmental impact of it. NewGeneration-SR was member of the Nu@ge consortium: one of five national Cloud Computing projects with “emprunts d’avenir” funding. With a CIFRE PhD student (Daniel Balouek), we are developing models to reduce the energy consumption for the benefit of data-center

## 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/www>.

## **AYIN Team**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. Bilateral Contracts and Grants with Industry**

### **6.1.1. Airbus D&S**

**Participants:** Paula Craciun, Josiane Zerubia [PI].

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

### **6.1.2. CNES Toulouse**

**Participants:** Ihsen Hedhli, Josiane Zerubia [PI].

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

### **6.1.3. CNES Toulouse**

**Participants:** Aurélie Boisbunon, Josiane Zerubia [PI].

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

## **6.2. Consulting for Industry**

Josiane Zerubia is a scientific consultant for the Galderma company.



**BACCHUS Team (section vide)**

**BAMBOO Project-Team (section vide)**

**BEAGLE Project-Team (section vide)**

## **BIGS Project-Team**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. 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: a research engineer has been hired by CYBERnano since November 2014 to develop and implement new algorithms devoted to biological signal processing.

## **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 developed.

## **BIPOP Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- Schneider Electric (Cifre Ph.D. thesis of N. Akhadkar)
- Ansys France (Cifre Ph.D. thesis of M. Haddouni)
- Aldebaran (Cifre Ph.D. thesis of J. Lafaye)
- Adept Technologies (Cifre Ph.D. thesis of S. al Homsi)

## **BONSAI Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- The PhD thesis of Lea Siegwald is funded by a CIFRE contract with the biotechnology company Gene Diffusion.

## **CAGIRE Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

Collaborative research contract with EDF: “Nouveau modèle de turbulence Haut-Bas Reynolds avec prise en compte de la thermique active ou passive. (New high-low Reynolds number turbulence model accounting for active or passive heat transfer)” associated with the PhD thesis of J.-F. Wald.

## **7.2. Bilateral Grants with Industry**

PhD grant (CIFRE) of J.-F. Wald, EDF, in progress.



## **CAIRN Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

Automatic Analysis, Classification and Processing of Audio Signals, Contract with Orange Labs.

## **CAMUS Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

The CAMUS team is taking part of the NANO 2017 national research program and its sub-project PSAIC (Performance and Size Auto-tuning thru Iterative Compilation) with the company STMicroelectronics, starting January 2015. Luis Esteban Campostrini has been recruited as PhD student in this project. His work will focus on extending the Apollo framework to dynamic analysis providing useful feedbacks to users regarding code optimization opportunities, and to code generation for ARM Cortex platforms.

## **CAMEL Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### **7.1.1. *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, 2014 and 2015.

**CARMEN Team (section vide)**

**CARTE Project-Team (section vide)**

**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 transferred 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. F. Bouquet is scientific consultant of Smartesting.

## 7.2. Electronic Voting Systems

**Participant:** Véronique Cortier.

A collaboration agreement has been signed between Loria and Scytl, a Spanish company who is proposing solutions for the organization of on-line elections, including legally binding elections, in several countries. We have a collaboration with David Galindo (who joined Scytl in July 2014) on defining security properties for e-voting (privacy as well as verifiability properties) and designing e-voting schemes that meet all these properties. Further contracts may cover the analysis of the solutions developed at Scytl.

## 7.3. Analysis of Electrum Bitcoin Wallet

**Participants:** Michaël Rusinowitch, Mathieu Turuani.

Electrum has signed a 2-month contract with Cassis for verifying its electronic bitcoin wallet. The protocol model has been specified in Aslan language and covers then registration of new users, the confirmation phase, and the usage of the wallet by the clients. Many optimisations techniques had to be used to limit state explosion, and *CL-AtSe* has been extended to cover a class of security properties with negative constraints that appear in this model, and might be useful for other protocol analysis. *CL-AtSe* has been applied to several scenarios to verify the security properties, and a few modifications were suggested to Electrum designer.

## **CASTOR Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

IFPEN : Studies of coarsening strategies for the meshes used in reservoir simulations - H. Guillard



**CELTIQUE Project-Team (section vide)**

## CIDRE Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

- **Thales contract (2014): “Capalid v2”**

This contract consists in validating an intrusion detection strategy in a supervised distributed system. This work relies on the results obtained by Erwan Godefroy in his PhD Thesis: considering the description of an attack and a description of the deployed system (topology, cartography, IDS deployment), we must answer the question: "Is it possible to detect this attack?". This answer consists in determining if it is possible to build a correlation rule that a correlation system can use to detect the attack.

- **CS contract (2014-2015): “SecEF”**

The COSCOM contract consists in analyzing current used standards for information security events. Such events following a standardized structure are needed to allow communications between the various security tools, in order to consolidate and correlate information, and for communications between different security response teams, to share information relative to incidents. Examples of such events are IDMEF (Intrusion Detection Message Exchange Format, RFC 4765) or IODEF (Incident Object Description Exchange Format, RFC 5070). Unfortunately, these two standards are insufficiently deployed on a market still dominated by proprietary formats. The objective of the SecEF (Security Exchange Format) project is thus to propose evolutions of these formats, based on the initial feedback from current users.

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

The theme of this contract focuses on the management of massively distributed data sets. In a nutshell, 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): “Embedded Systems Security”**

We have initiated a research program in collaboration with HP Labs in the domain of embedded systems security. We aim at researching and prototyping low-level intrusion detection mechanisms in embedded system software. This involves mechanisms in continuation of previous work realized by our team as well as investigating new techniques more directly tied to specific device architectures. Details about this research program cannot be provided as they are covered by a non-disclosure agreement.

## 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. The PhD defense of Georges Bossert was held in December 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. These criteria are offered by Mistore to its clients when they manipulate their data. Pierre Obame, whose PhD thesis is planned to terminate in February 2015, is in the process of writing his PhD manuscript so as to defend it by April 2015.

- **Orange Labs: “Privacy-preserving location-based services”**

Solenn Brunet has started her PhD thesis since 2014 within the context of a CIFRE contract with Orange Labs Caen. Her PhD subject concerns the development of privacy-preserving location-based services that are able to personalize the service provided to the user according to his current position while preserving his location privacy. In particular, Solenn will adapt existing cryptographic primitives (private information retrieval, secure multiparty computation, secure set intersection, ...) or design novel ones to use them as building blocks for the construction of these privacy-preserving location-based services.

- **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 visualization mechanisms dedicated to the analysis of security events, for instance for forensic purposes. The CORGI tool presented earlier in this document is the most recent contribution to this contract.

- **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 (section vide)**

## 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, (3) carry out nowcasting rain events from radar images.

## COAST Team

# 6. Bilateral Contracts and Grants with Industry

## 6.1. Bilateral Grants with Industry

### 6.1.1. *CIFRE Grant with Bonitasoft*

**Participants:** François Charoy, Samir Youcef.

Bonitasoft is a leading software company in the domain of open source Business Process Management Systems. The objective of this grant is to help Bonitasoft to support effective elastic BPM operation in the Cloud by leveraging both the business knowledge, the process models and the execution history of process instances and correlate them with cloud resource consumption. Guillaume Rosinoski has been recruited as a PhD Student to work on this project. We will define models that will be validated based on a detailed analysis of existing use cases that we have started to collect from Bonitasoft and its clients.

## COATI Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. *Amadeus (May 2014 - April 2015)*

**Participants:** Marco Biazzi, David Coudert, Stéphane Pérennes, Michel Syska.

Duration: May 2014 - April 2015

Inria teams: Scale, Coati

Abstract: This collaboration aims to assess the benefits that digital technologies can bring in complex travel distribution applications. Indeed, these applications require both high performance algorithms and distributed programming methods to search for the best solutions among billions of combinations, in a very short time thanks to the simultaneous use of several hundreds (if not thousands) of computers. These benefits will be demonstrated in an application to build 'off the shelf' optimized packages, fully customized to best meet the complex demands of the traveler.

## 7.2. Bilateral Grants with Industry

### 7.2.1. *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*.

### 7.2.2. *Contract CIFRE with KONTRON, 11/2011 - 4/2015*

**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.

### 7.2.3. *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 joint laboratory Inria / Alcatel-Lucent Bell-labs France within the ADR Network Science and works on the fast computation of topological properties (hyperbolicity, covering, etc.).

## **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**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- EDF, PhD thesis of N. Gréville, 'Numerical methods for solving stochastic equilibrium problems'.
- IFPEN, PhD thesis of F.Bleuse, 'Optimal control and robustness for rechargeable hybrid vehicles'. The study is focused on the so-called parallel architecture, with both the thermal and electric engines able to move the vehicle. The main axis is to optimize the use of the thermal engine.
- Safety Line (startup in aeronautics), research and transfer contract, optimization of fuel consumption for civil planes. A first part is devoted to the identification of the aerodynamic and thrust characteristics of the plane, using recorded flight data. A second part is optimizing the fuel consumption during the climb phase.

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## COMPSYS Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. ManycoreLabs Project with Kalray

Compsys is part of a bilateral contract 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.

Compsys role is to explore analysis and compilation techniques linked to streaming languages, with the Kalray MPPA platform as long-term target. The research on OpenStream described in Section 6.6 corresponds to the work package WP 2.5.3. This study shows the need for extending polyhedral techniques to polynomials, which is one of the motivation of the work described in Section 6.7 . Finally, the work on parametric tiling (Section 6.9 ), first in the context of FPGA, then of GPUs, is a first step towards the automatic generation of blocking algorithms for multicores such as the Kalray MPPA.

## 7.2. Technological Transfer: XtremLogic Start-Up

The XTREMLOGIC start-up (former Zettice project) was initiated 3 years ago by Alexandru Plesco and Christophe Alias, after the PhD thesis of Alexandru Plesco under the guidance of Christophe Alias, Alain Darté and Tanguy Risset. The goal of XTREMLOGIC is to build on the disruptive technologies emerging from the polyhedral compilation community, and particularly the results obtained in Compsys to provide the HPC market with efficient and communication-optimal circuit blocks (IP) for FPGA.

The compiler technology transferred to XTREMLOGIC (see Section 6.2 ) is the result of a tight collaboration between Christophe Alias and Alexandru Plesco. XTREMLOGIC is a unique opportunity to spread the polyhedral technology to industry.

XTREMLOGIC won several prizes and grants: “concours émergence OSEO 2013” at Banque Publique d’Investissement, “most promising start-up award” at SAME 2013, “lean Startup award” at Startup Weekend Lyon 2012, “excel&rate award 2012” from Crealys incubation center.

## 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 (STMicroelectronics).

**CORIDA Team (section vide)**

## CQFD Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Airbus

**Participants:** Benoîte de Saporta, François Dufour, Christophe Nivot.

We are interested in the optimization of a launcher integration process. It comprises several steps from the production of the subassemblies to the final launch. The four subassemblies go through various types of operations such as preparation, integration, control and storage. These operations are split up into three workshops. Due to possible breakdowns or staff issues, the time spent in each workshop is supposed random. So is the time needed to deliver the subassemblies, for similar reasons including e.g. shipping delays. We also have to deal with constraints related to the architecture of the assembly process itself. Indeed, we have to take into account waiting policies between workshops. The workshops may work in parallel but can be blocked if their output is not transferred to the next workshop in line. Storage capacity of output products is limited.

Our goal is finding the best rates of delivery of the subassemblies, the best choice of architecture (regarding stock capacities) and the best times when to stop and restart the workshops to be able to carry out twelve launches a year according to a predetermined schedule at minimal cost. To solve this problem, we choose a mathematical model particularly suitable for optimization with randomness: Markov decision processes (MDPs).

We have implemented a numerical simulator of the process based on the MDP model. It provides the fullest information possible on the process at any time. The simulator has first been validated with deterministic histories. Random histories have then been run with exponentially distributed delivery times for the subassemblies and several families of random laws for the time spent in each workshop. Using Monte Carlo simulations, we obtain the distribution of the launch times. Preliminary optimization results allow choosing stock capacities and delivery rates that satisfy the launch schedule.

In this context, the PhD Thesis of Christophe Nivot (2013-2016) is funded by Chaire Inria-Astrium-EADS IW-Conseil régional d'Aquitaine.

## 7.2. Thales Optronique

**Participants:** Benoîte de Saporta, François Dufour, Alizée Geeraert.

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 Alize Geeraert (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.

**CRYPT Team (section vide)**

## **CTRL-A Exploratory Action**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. CIFRE PhD grant Orange**

This Cifre PhD started in the beginning of 2012, and is going to be defended in april 2015, on the topic of "Discrete Control for Smart Environments through a Generic Finite-State-Models-Based Infrastructure". Hassane Alla and Eric Rutten are advising the PhD student for 10%.

One result of this cooperation is that a patent deposited at the INPI on "Configuration automatique du controle discret d'entites physiques dans un systeme de supervision et de controle", by Gilles Privat et Mengxuan Zhao (Orange labs), Hassane Alla (Gipsa-lab), Eric Rutten (Inria).

## **7.2. Bilateral Grants with Industry**

Our cooperation with CEA LETI/LIST (V. Olive) at Grenoble Minatec is bilateral, involving:

- the Inria Post-Doc grant of Julio Cano, to work with L. Guergen on ECA-based programming in the IoT
- the CEA PhD grant of Adja Sylla, to work with F. Pacull and M. Louvel on high-level programming on top of a rule-based middleware.



## **DAHU Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

The CIFRE scholarship of David Montoya started in 2014, with Sinovia, Cofely Ineo (group GDF Suez). The topic is on analysis of multimodal itineraries.

## DANTE Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. HiKoB

**Participant:** Éric Fleury.

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.

### 7.1.2. Orange R&D

**Participant:** Isabelle Guérin Lassous.

A contract has been signed between Inria and France Télécom for the PhD supervision of Laurent Reynaud. The PhD thesis subject concerns mobility strategies for fault resilience and energy conservation in wireless networks.

### 7.1.3. GranDATA

**Participants:** Márton Karsai [correspondant], Éric Fleury.

Founded in 2012, Grandata is a Palo Alto-based company that leverages advanced research in Human Dynamics (the application of “big data” to social relationships and human behavior) to identify market trends and predict customer actions. Leading telecom and financial services firms are using Grandata’s Social Universe product to transform “big data” into impressive business results.

The DANTE team and Grandata started to collaborate in 2014 on the analysis of large datasets provided by the company. The aim of the collaboration is to gain better understanding about the dynamical patterns of human interactions, mobility, and the socio-economic structure of the society. As a part of this collaboration Carlos Sarraute (Grandata - R&D Director) visited the Dante team on November and Yannick Leo (DANTE - PhD student) visited Grandata office in Buenos Aires in 2014 December.

### 7.1.4. STACC, Skype/Microsoft Labs

**Participant:** Márton Karsai [correspondant].

The Software Technology and Applications Competence Centre (STACC) is a research and development centre conducting high-priority applied research in the field of data mining and software and services engineering. Together with Skype/Microsoft Labs, STACC maintains a long lasting research collaboration with Márton Karsai (DANTE) on the modeling the adoption dynamics of online services.

## 7.2. Inria Alcatel-Lucent Bell Labs joint laboratory

**Participants:** Isabelle Guérin Lassous, Paulo Gonçalves, Thomas Begin, Éric Fleury [correspondant].

The main scientific objectives of the collaboration within the framework Inria Alcatel-Lucent Bell Labs joint laboratory is focused on network science:

- 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.

**DEDUCTEAM Exploratory Action (section vide)**

## **DEFI Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- 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)

## **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 electromagnetic 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**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. Bilateral Contracts with Industry**

We have signed an industrial technological transfer and research contract with VIVALTIS company (Montpellier, France), on surface FES.

## **DIANA Team**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. Bilateral Contracts with Industry**

In the context of the common Inria - Alcatel Lucent Bell-Labs laboratory on Communication networks of the future, we participate to the Content Centric Networking ADR (Action de Recherche). We are currently discussing with Diego Perino team from Alcatel Lucent Bell-Labs to define a research program for a post-doctoral position.

## **6.2. Bilateral Grants with Industry**

We are collaborating with the startup Novathings to deploy early stage privacy leaks monitoring and control solutions. We have proposed in Meddle a VPN based infrastructure performing SSL-bumping in order to capture all the mobile data traffic and to inspect even the SSL flows. The biggest advantage is that, as most mobile platforms support VPNs, we don't need any installation or root access on the devices to perform traffic redirection and inspection. We have a Carnot funding for one year engineer position that will start in April 2015 to implement a new solution on a home appliance sold by Novathings to improve transparency and control for personal devices.

## **DICE Team**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. Bilateral Contracts with Industry**

DICE has bilateral contracts with two large companies.

**Worldline** Worldline 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.

**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 equipment, 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**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. Bilateral Contract with Industry: ALSTOM-Inria Common Lab**

**Participants:** Bruno Tuffin, Gerardo Rubino.

Bruno Tuffin is the co-director of ALSTOM-Inria common Lab.

The group currently manages a project with ALSTOM on system availability simulation taking into account logistic constraints. Current ALSTOM Transport and Power contracts, especially service-level agreements, impose stringent system availability objectives. Non-adherence to the required performance levels often leads to penalties, and it is therefore critical to assess corresponding risk already at a tender stage. The challenge is to achieve accurate results in a reasonable amount of time. Monte Carlo simulation provides estimates of the quantities it is desired to predict (e.g., availability). Since we deal with rare events, variance reduction techniques, specifically Importance Sampling (IS) here, is used. The goal of the project is to establish the feasibility of IS for solving problems relevant to ALSTOM and to develop the corresponding mathematical tools.

## **6.2. Bilateral Contract with Industry: Participation in a CRE with Orange**

**Participant:** Bruno Tuffin.

We are participating to a CRE (managed by Telecom Bretagne) with Orange on the strategies of Content Delivery Networks (CDNs) and their impact on the overall Internet economy and regulation. In this study, we focus on the CDN as an economic actor. The goals are 1) to analyze CDNs' caching strategies from an economic point of view, 2) to study the strategies of an integrated CDN actor, and 3) to study the impact of CDNs in the net neutrality debate.

## **6.3. Bilateral Contract with Industry: Data-aggregation for large-scale distributed networks**

**Participants:** Bruno Sericola, Romaric Ludinard.

This was 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 user's place, 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 pose the problem of privacy and data aggregation may allow preserving the privacy while collecting data.

## **6.4. Cifre contract on LOCARN: Low Opex and Capex Architecture for Resilient Networks**

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

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, or LOCARN), which do not require any network management or configuration.



## 6.5. Cifre contract on Small Cell Networks

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

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.

## 6.6. Cifre contract on a dynamic adaptive service-driven SDN architecture

**Participants:** Jean-Michel Sanner, Yassine Hadjadj-Aoul, Gerardo Rubino.

This is a Cifre contract (2013-2016) including a PhD thesis supervision, done with Orange Labs, on defining a dynamic adaptive service-driven network architecture based on the SDN concept.

## 6.7. Cifre contract on defining an open, a flexible and a unified network architecture

**Participants:** Yue Li, Yassine Hadjadj-Aoul, Gerardo Rubino.

This is a Cifre contract (2013-2016) including a PhD thesis supervision, done with Orange Labs, on designing an open, flexible and unified network architecture.

## 6.8. DGA Grant

**Participant:** Adlen Ksentini.

This DGA grant, with Cifre Inria team, is for the PhD supervision of Florient Grandhomme. The aim of the PhD program is to study a new routing protocol for MANET.

## 6.9. DVD2C

**Participant:** Adlen Ksentini.

We are working in the 3-year (September 2014 to September 2017) FUI Project DVD2C, which aims to virtualize CDN through the Cloud and Network Function Virtualization concept. DVD2C is led by Orange Labs, and the partners are two SMEs (Viotech and Resonate) and two academics (our team and Télécom Paris Sud).

## 6.10. IPChronos

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

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, ended. Our contribution focused on developing analytical models to estimate, based on the IEEE 1588 protocol, the end-to-end delay. IPChronos was led by ORALIA SPECTRACOM, and the partners are IPlabel and our team.

## 6.11. Camion

**Participants:** Yassine Hadjadj-Aoul, César Viho, Raymond Marie, Pantelis Frangoudis.

We are working in the 2-year (October 2014 to October 2016) Eurostars European Project Camion, which aims at offering cost-efficient, QoE-optimized content delivery, allowing for faster content access, as well as offline operation, while improving wireless network capacity and coverage. Camion is led by JCP-Connect, and the partners are a SME (FON) and our team.

## **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 contracts made by Alban Quadrat, Silviu Niculescu and Hugues Mounier (L2S, University Paris Sud).

## **DIVERSE Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### **7.1.1. Bilateral industrial partnerships**

#### *7.1.1.1. Partnership with Thales*

Dates: 2011-2014

This partnership with Thales Research and Technology explores variability management both in modeling and metamodeling (*i.e.*, design and implementation of software languages). At the model level, this collaboration is a direct follow-up of the MOVIDA and the MUTATION projects, in which we explore the challenges related to software product line and multi-view engineering for the different development phases of systems of systems construction. At the metamodeling level, we investigate how the notions of variability modeling and management can serve the rigorous definition of families of modeling languages, which address the different interpretations of UML needed to model the different viewpoints in the systems engineering.

The project 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.

#### *7.1.1.2. CIFRE grants*

- All4Tec (2011-2014). In this project with the All4Tec company we investigate the support of variability modelling for model-based test generation with Matelo (a tool developed by All4Tec). In this context, Benoit Baudry acts as Ph.D advisor for Hamza Samih.
- Zenexity (2011-2014). 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.
- Orange (2014-2017). In this project with the Orange company we investigate the support of trust in web communication using software reconfiguration techniques. In this context, Olivier Barais acts as Ph.D advisor for Kevin Corre with Gerson Sunye.

## **DOLPHIN Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- **EDF** (2011-2014): the goal of this bilateral contract is to formulate pricing problems of electrical energy using bilevel mathematical programs.
- **EDF** (2011-2014): this contract models and solves scheduling outages of nuclear plants under uncertainty (Phd of N. Dupin).
- **BeTravel** (2012-2014): this CIFRE project deals with the optimization of group travel plannings (Phd of M. Bue).
- **Tasker** (2011-2014): the goal of this CIFRE project is the multi-objective scheduling of applications in public cloud computing systems (Phd of F. Legillon).
- **Strat-Logic** (2012-2015): the objective of this CIFRE contract is the optimization of economic decisions in a competitive business management simulator (Phd of S. Dufourny).
- **Vekia** (2012-2015): the goal of the CIFRE project is to develop an efficient and generic software for employee scheduling in retail (Phd of M. Gérard).
- **PIXEO** (2014-2015): the objective of this bilateral project is the predictive models and knowledge extraction for insurance web comparator.

## **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 therefore strengthens 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. SoCTrace

**Participants:** Serge Vladimir Emteu Tchagou, Alexandre Termier.

SoCTrace is a FUI project led by STMicroelectronics, with the companies ProbaYes and Magilem, Université Joseph Fourier and Inria Rhône-Alpes. Its goal is to provide an integrated environment for storing and analyzing execution traces. In this project, we are working on data mining techniques for analyzing the traces, and on the use of ontologies to enable querying traces with a higher level of abstraction.

### 7.1.2. *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 policies, for example "if memory full then delete (directory)". At regular intervals the 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 is realised using rules: crash rules are learnt, they are transformed in preventive rules by an expert and embedded on the phone.

### 7.1.3. *Particular contract of the strategic action EDF/Inria*

**Participants:** Thomas Guyet, René Quiniou, Véronique Masson.

At the time of digitalization of multi-channel customer relations, the analysis of customer pathways has become a strategic issue for any business unit. The interaction traces left by clients when connecting to the customer services can be combined with data from other communication channels (phone, web form, e-mail, mail, fax, SMS, shop, etc.) and allow to analyse the customer pathways in details.

Pattern mining tools are able to extract the frequent customer behaviors in very large database of client pathways, but taking into account the duration and the delay between the customer actions remains a challenging issue for pattern mining. The objective of this one year particular contract was to design and to develop a frequent mining tool taking into account the time dimension for analysis of multichannel customer pathways.

## **DREAMPAL Team**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. 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.

Collaboration contract with NAVYA: In conjunction with the doctoral grant of Karim Ali, a collaboration contract is established with NAVYA. The objective is to design an innovative embedded system dedicated for dynamic obstacle detection and tracking for autonomous vehicle navigation.

**DYLISS Project-Team (section vide)**



## **DYOGENE Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### **7.1.1. MSR-Inria Joint Lab**

- **Social Information Networks and Privacy**  
Online Social networks provide a new way of accessing and collectively treating information. Their efficiency is critically predicated on the quality of information provided, the ability of users to assess such quality, and to connect to like-minded users to exchange useful content.  
To improve this efficiency, we develop mechanisms for assessing users' expertise and recommending suitable content. We further develop algorithms for identifying latent user communities and recommending potential contacts to users.
- **Machine Learning and Big Data**  
Multi-Armed Bandit (MAB) problems constitute a generic benchmark model for learning to make sequential decisions under uncertainty. They capture the trade-off between exploring decisions to learn the statistical properties of the corresponding rewards, and exploiting decisions that have generated the highest rewards so far. In this project, we aim at investigating bandit problems with a large set of available decisions, with structured rewards. The project addresses bandit problems with known and unknown structure, and targets specific applications in online advertising, recommendation and ranking systems.

### **7.1.2. CRE with Orange**

CRE contract titled "Distribution of the SINR in real networks" between Inria and Orange Labs have been realized. P. Keeler was hired by Inria as a research engineer within this contract. It is a part of the long-term collaboration between TREC/DYOGENE and Orange Labs, represented by M. K. Karray, for the development of analytic tools for the QoS evaluation and dimensioning of operator cellular networks.

## **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. 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...

## **ECUADOR Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- Ecuador and Lemma share the results of Gautier Brèthes' thesis, which is partly supported by Lemma, the other part being supported by a PACA region fellowship.
- Ecuador and Lemma have a bilateral contract to share the results of Stephen Wornom.
- Ecuador and EDF have a bilateral contract on AD of the hydrology code "Mascaret". The correspondent on the Ecuador side is Valérie Pascual.

**ESTASYS Exploratory Action (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)*

**Participants:** David Filliat [correspondant], Emmanuel Battesti.

Development of extension of a planning algorithm on a autonomous electric car for Renault SAS. We improved 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 developed by Renault with several academic partners. The final demonstration of the system was made in october 2014.

## 7.2. Bilateral Grants with Industry

### 7.2.1. *Development of an Contextual electronic copilot for driving assistance*

**Participants:** David Filliat [correspondant], Alexandre Armand.

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

### 7.2.2. *Curiosity and visual attention*

**Participants:** David Filliat [correspondant], Celine Craye.

Financing of the CIFRE PhD grant of Celine Craye by Thales S.A. with the goal of developing a mechanism of visual attention guiding the exploration of a robot.

### 7.2.3. *Auto-Apprentissage Auto-Adaptable pour la compliance au traitement*

**Participants:** Manuel Lopes [correspondant], Alexandra Delmas, Pierre-Yves Oudeyer, Benjamin Clement.

Financing of the CIFRE PhD grant of Alexandra Delmas by Itwell with the goal of developing a tool for self-learning for patients to improve their compliance to treatment.

## **FLUMINANCE Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### **7.1.1. Contrat CERSAT/IFREMER**

**Participants:** Etienne Mémin, Valentin Resseguier.

*duration 36 months.* This partnership between Inria and Ifremer funds the PhD of Valentin Resseguier, which 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.



**FOCUS Project-Team (section vide)**

## FUN Project-Team

# 6. Bilateral Contracts and Grants with Industry

## 6.1. Etineo Partnership

**Participants:** Roudy Dagher, Salvatore Guzzo Bonifacio, 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. Publications in 2014 in the framework of EtiPOPS are [32], [11] and software modules.

## 6.2. Traxens partnership

**Participants:** Natale Guzzo, Nathalie Mitton [correspondant].

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

## **GALAAD2 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**

- **Microsoft Research, Cambridge, UK:** Large Scale Diverse Learning for Structured Output Prediction [Ph.D. thesis D. Bouchacourt]
- **General Electric HealthCare, Buc, FR:** Patient-Specific Optimization of Computed Tomography Acquisition Protocols [Ph.D. thesis H. Pasquier]

## 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 OCaml 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
- Multitude
- 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.

## **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.

## **GANG Project-Team**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. Alcatel-Lucent Bell Labs**

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

Gang has a strong collaboration with Alcatel-Lucent. We notably collaborate with Fabien Mathieu and Diego Perino who are former members of Gang that have joined Alcatel-Lucent. A Cifre grant allows to fund the PhD thesis of The-Dang Huynh to study ranking techniques and their application to social networks. An ADR (joint research action) is dedicated to content centric networks and forwarding information verification. The PhD thesis of Leonardo Linguaglossa is funded by this contract. We also collaborate with Ludovic Noirie on voting systems.

This collaboration is developed inside the Alcatel-Lucent and Inria joint research lab.

## **GCG Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- Tirez is a bilateral contract with Kalray. The subject is a prototyping of hybrid alias analysis. The collaboration lead to a recent submission which corresponding work is described in [6.10](#) .
- GCG is involved in another contract with Kalray associated with the CIFRE PhD of Duco van Amstel. The subject of the collaboration is related to fine grain scheduling. Corresponding work is described in [6.9](#) .

## **7.2. Bilateral Grants with Industry**

- ManyCoreLabs is a bilateral Grant (BGLE) with Kalray. GCG is involved in the development of generalized register tiling.



**GECO Project-Team (section vide)**

## GENSCALE Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. *Kalray Company : Parallelization of bioinformatics algorithm on the MPPA Platform*

**Participants:** Charles Deltel, Dominique Lavenier.

The purpose was to investigate the performances of the Kalray MPPA architecture on scientific life science software. The collaboration started in 2013, and was aiming at implementing the PLAST software on the Kalray MPPA chip (256 cores). PLAST is a BLAST-like parallel implementation designed by GenScale. Experimentations have shown that for these kinds of applications that manage very huge volume of data, the MPPA chip memory capacity was a serious bottleneck.

### 7.1.2. *Sofiproteol Company : Detection of SNPs in the Pea genome*

**Participants:** Susete Alves Carvalho, Pierre Peterlongo.

The Peapol project is funded by Sofiproteol Company. Its 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 to detect SNPs in the pea genome.

## 7.2. Bilateral Grants with Industry

### 7.2.1. *Korilog: I-Lab KoriScale*

**Participants:** Sébastien Brillet, Erwan Drezen, Dominique Lavenier, Ivaylo Petrov.

In June 2013, GenScale and the Korilog Company created an Inria common research structure (I-LAB) called KoriScale. This is the outcome of a solid relationship, which has enabled 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.

### 7.2.2. *Rapsodyn project*

**Participants:** Dominique Lavenier, Claire Lemaitre, Pierre Peterlongo.

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 optimization of the rapeseed oil content and yield under low nitrogen input. GenScale is involved in the bioinformatics work package, 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. Cifre Contract 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 2014, GEOMETRY FACTORY (<http://www.geometryfactory.com>) had the following new customers for CGAL packages developed by GEOMETRICA:

LMI Technologies (Canada, GIS): 2D triangulations

Rio Tinto (Australie, mining): 2D triangulations

Geovariances (France, oil and gas): 3D triangulations and meshes

Elektrobit (Allemagne, GIS): 2D triangulations

First Light Fusion (UK, energie): 2D triangulations

**GEOSTAT Project-Team (section vide)**

## **GRACE Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### **7.1.1. Alcatel-Lucent**

Within the framework of the joint lab Inria-ALU, Grace and Alcatel-Lucent collaborate on the topic of Private Information Retrieval: that is, enabling a user to retrieve 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; this is classically obtained through encryption, which prevents access to data in the clear.)

A typical application would be a centralized database of medical records, which can be accessed by doctors, nurses, and so on. A desirable privacy goal would be that the central system does not know which patient is queried for when a query is made, and this goal is precisely achieved by a Private Information Retrieval protocol. Note also that in this scenario the database is not encrypted, since many users are allowed to access it.

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 hired Man-Cuong Ngo as a PhD student, in February 2014. We proposed a much better way of using LDC codes in PIR protocols, allowing less storage and a very small number of servers. This idea was at the heart of a European patent (EP14305549.9), co-submitted by Inria and Alcatel-Lucent. A preliminary presentation was made at CANS [19].

## GRAPHIK Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. CTFC

**Participants:** Patrice Buche, Jérôme Fortin.

We collaborate since 2012 with the technical center of Comtois' cheese (CTFC : Centre Technique des Fromages Comtois). The objective of this collaboration is to design and test a platform for expert knowledge management. This allows 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. In order to evaluate our approach on different agri-food chains, we have initiated a work with Panzani (6 months internship of Laureline Estival 2013-2014) and established fruitful contacts with other partners.

This collaboration will be strengthened in 2015 in a enlarged project involving different traditional food chains (CNAOL, Conseil National des Appellations d'Origine Laitière). The new project called « OcamEx : Outil de capitalisation et de mobilisation du savoir-faire et de l'expérience fromagers en filière valorisant leur terroir. » is presented as a collaboration with technical partners (Ceraq, CTFC (Centre Technique des Fromages Comtois), Pôle fromager AOP Massif Central, Institut de l'Elevage, Actalia, Typ-Tech), CNAOL (Conseil national des appellations d'origines laitières) scientific partners (INRA Aurillac, INRA URTAL Poligny, UMR IATE (équipe Ingénierie des connaissances), UMR LIRMM/Inria (équipe GraphiK), UMR HEUDIASYC (équipe Décision), Agrosup Dijon UR DPF, INRA UMR I2M Bordeaux, ENSC Bordeaux training partners : Enils from Aurillac, Mamirolle-Poligny and la Roche sur Foron Cheese partners : Comté (CIGC), Reblochon (SIR), Emmental (Savoicime), Cantal et Salers (CIF)

The aim of this collaboration is to develop a platform that will be used in traditional cheese processing for expert knowledge management.

### 7.1.2. ABES

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

Collaboration with ABES. Funding of half a PhD grant (Léa Guizol, 2011-2014). See Section 6.4 .

### 7.1.3. 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 by showing that our techniques 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.

**HEPHAISTOS Team (section vide)**

## **HIEPACS Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

Airbus Defence and Space research and development contract:

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

CEA DPTA research and development contract:

- Olivier merci de compléter, lien avec Runtime

CEA-CESTA research and development contract:

- Performance analysis of the recent improvements in PaStiX sparse direct solver for matrices coming from different applications developed at CEA-CESTA.

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); Mathieu Faverge, Pierre Ramet, Jean Roman).

TOTAL research and development contracts:

- Parallel hybrid solver for massively heterogeneous manycore platforms (Stojce Nakov (PhD); Emmanuel Agullo, Luc Giraud, Abdou Guermouche, Jean Roman).

## **7.2. Bilateral Grants with Industry**

Airbus Group Innovations research and development contract:

- Design and implementation of FMM and block Krylov solver for BEM applications. The HiBOX project is led by the SME IMACS and funded by the DGA Rapid programme.



## 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 2014, Inria took part with EDF to the specification of a simplified OCARI stack for a porting to a 32 bit platform and provided support to the SME in charge of developing this stack.

## 7.2. Bilateral Grants with Industry

**Participants:** Paul Muhlethaler, Gerard Le Lann.

This work aims at improving the reliability of some SAGEM communications systems.

## HYBRID Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. 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 on-going 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.

### 7.1.2. MBA Multimedia

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

This on-going 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 to MBA Multimédia company for future applications in the field of multimedia and web design based mainly on HTML5 and Word Press software.

### 7.1.3. Polymorph Studio

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

This on-going 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 to Polymorph Studio company for future applications in the field of multimedia and web design based mainly on Unity3D software.

## 7.2. Bilateral Grants with Industry

### 7.2.1. Orange Labs

**Participant:** Anatole Lécuyer.

This grant started in October 2012 and ended in 2014. It has supported Pierre Gaucher's CIFRE PhD program on "Novel 3D interaction techniques based on pseudo-haptic feedback".

### 7.2.2. Technicolor

**Participants:** Fabien Danieau, Anatole Lécuyer.

This grant started in January 2011 and ended in 2014. It has supported Fabien Danieau's CIFRE PhD program on "Improving audiovisual experience with haptic feedback".

**HYCOMES Team (section vide)**

## **I4S Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### **7.1.1. PhD CIFRE with EDF**

**Participants:** Nassif Berrabah, Qinghua Zhang.

A joint PhD project between Inria and EDF (Electricité de France) has been started since December 2014. The purpose of this study is to develop methods for the monitoring of electrical cables in power stations, in order to prevent failures caused by aging or accidental events. This project is funded by EDF and by the ANRT agency for three years.

### **7.1.2. 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 .

In 2014, the damage detection toolbox has been launched [http://www.svibs.com/products/ARTEMIS\\_Modal\\_Features/Damage\\_Detection.aspx](http://www.svibs.com/products/ARTEMIS_Modal_Features/Damage_Detection.aspx).

### **7.1.3. Contracts with A3IP**

**Participant:** Vincent Le Cam.

A licensing work has been initialized at IFSTTAR in order to sold some licenses of PEGASE 2 to companies who would like to use, modify, extend and sell the functions in the Structural Health Monitoring world. Separate and non-exclusive licenses will be regarded to:

- a) sell the PEGASE 2 devices : mother and daughter boards
- b) sell the PEGASE 2 Supervisor

### **7.1.4. 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 pursue the work achieved in FLiTE2 and started in June 2011 funded by Dassault Aviation and the ANRT agency. PhD of P. Mellinger has been defended in December 2014.

### **7.1.5. Collaboration with Bruel and Kjaer**

**Participants:** Laurent Mevel, Ivan Guéguen.

Collaboration has started on analysis on wind turbines data. A paper has been presented at EWSHM 2014.

### **7.1.6. Contract with SNCF**

**Participants:** Vincent Le Cam, Mathieu Le Pen.

Deployment of a set of PEGASE platform for SNCF: SNCF has just signed a contract in view of instrumenting 2 railways sites where the needs of wireless and smart sensors has been expressed. I4S contribution will mainly focus on data processing and algorithms implementation.

### **7.1.7. Contract with GDF**

**Participants:** Vincent Le Cam, Mathieu Le Pen.

GDF (national french Gaz company) has signed a wide contract with IFSTTAR relative to many items in Wireless Sensors Networks. One of the items will be prototyped on PEGASE 2 platform and consists in finding an accurate solution for WSN synchronization without GPS source and for an autonomy of 10 years. One of the identified solution will be prototyped on PEGASE 2 as wireless and generic development platform and as it offers an accurate 100 nanoseconds absolute time reference.

### **7.1.8. Collaboration with SIEMENS**

**Participant:** Jean Dumoulin.

Since 2012, a work has been initiated for thermal studies for SIEMENS about subway infrastructures. 2013 was dedicated to the study of thermal instrumentation of subway. 2014 was focused on the instrumentation of a rail mockup in Nantes.

## IBIS Project-Team

# 6. Bilateral Contracts and Grants with Industry

## 6.1. Genostar

**Participants:** François Rechenmann, Hidde de Jong, Michel Page.

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

**Participants:** Johannes Geiselmann, Hidde de Jong, Corinne Pinel.

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). Corinne Pinel works part-time at BGene, and Johannes Geiselmann and Hidde de Jong are members of its scientific advisory board. For more information on BGene, see <http://www.bgene-genetics.com/>.

## IMAGINE Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts and Grants with Industry

### 7.1.1. *Airbus - Idealization of components for structural mechanics (06/2011 - 06/2014)*

**Participants:** Stefanie Hahmann, Jean-Claude Léon.

Cifre PhD in partnership with Airbus group 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.

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

**Participant:** 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 Amigual4Home project (ANR-11-EQPX-0002).

**IN-SITU Project-Team (section vide)**



**INDES Project-Team (section vide)**

## **INFINE Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. GranData**

**Participants:** Aline Carneiro Viana, Eduardo Mucelli.

Since June 2014, we have a collaboration with GranData (<http://grandata.com/>), Buenos Aires, Argentina on traffic vs mobility modeling of smartphone users. GranData is a small company that integrates first-party and telco partner data to understand key market trends, to predict customer behavior, and to deliver business results. Its products integrates and analyzes diverse data traces (e.g., telco, social media, or mobile data) to generate behavioral insights and deliver targeted mobile marketing. Part of the thesis of Eduardo Mucelli analysis data traffic using telco traces provided by GranDats. While this collaboration allow us collaborating with machine learning experts, GranData has the opportunity to get our expertise in mobility analysis.

**IPSO Project-Team (section vide)**

**KALIFFE 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. 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 G. Antoniu. The project also provides funding for the PhD thesis of Luis Pineda, started in 2014. The project is being conducted in collaboration with the Zenith team from Montpellier, led by Patrick Valduriez.

## LAGADIC Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. Robocortex

**Participants:** Souriya Trinh, Fabien Spindler, François Chaumette.

*no. Inria Rennes 8492, duration: 13 months.*

This contract with the Inria spin off company Robocortex started in March 2014. It is devoted to the visual tracking and 3D localization of some particular targets.

## 7.2. Bilateral Grants with Industry

### 7.2.1. 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 6.3.5).

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

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

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.

## 7.2. 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 challenges 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.

## 7.3. WayWay, OMB LABS

**Participants:** Matthijs Douze, Julien Mairal, Mattis Paulin, Jerome Revaud, Cordelia Schmid.

The collaboration with OMB Labs consisted of transferring technology developed at LEAR for large-scale image classification for the web application wayway.us. The company is developing a smartphone application for recommending restaurants and social places in US cities by exploiting image content from Instagram. Their system requires automatically classifying Instagram images into a few well-defined categories, “food”, “people” and “atmosphere”. Through a consulting project, with visits of engineers from OMB Labs, the team has helped them develop a full image classification pipeline to suit their industrial needs.

## 7.4. Xerox Research Center Europe

**Participants:** Matthijs Douze, Zaid Harchaoui, Mattis Paulin, Cordelia Schmid.

The collaboration with Xerox has been on-going since October 2009 with two co-supervised CIFRE scholarships (2009–2012; 2011–2014). Starting June 2014 we signed a third collaborative agreement for a duration of three years. The goal is to develop approaches for large-scale recognition and deep learning based image description.

## **LEMON Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### ***7.1.1. Free surface hydraulics***

The finite volume-based, SW2D computational code (see Software section) is used by the **Cereg Ingénierie** company on a regular basis to carry out flood risk assessment studies. The code is constantly being developed on a work-for-hire basis depending on the company needs. The developments mostly concern pre- and post-processing functionalities, as well as specific hydraulic modules.



**LFANT Project-Team (section vide)**

## **LIFEWARE Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contract with General Electric Transportation**

Research contract on “Energy optimization in mass transport”. Accompanying contract for the CIFRE thesis of David Fournier [3] (2011-2014).

## **LINKMEDIA Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

CIFRE Ph. D. contract with Institut National de l'Audiovisuel (Bingqing Qu)

CIFRE Ph. D. contract with Institut National de l'Audiovisuel (Ludivine Kuznik)

CIFRE Ph. D. contract with Orange (Mohamed-Haykel Boukadida)

CIFRE Ph. D. contract with Technicolor (Himalaya Jain)

## **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.

**M3DISIM Team (section vide)**

## **MADYNES Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Grants with Industry**

### **7.1.1. Inria-EDF Strategic action MS4SG**

**Participants:** Yannick Presse, Benjamin Segault, Laurent Ciarletta [contact].

*Vincent Chevrier (Maia team, LORIA) is a collaborator and correspondant for the MS4SG project. Benjamin Camus, Victorien Elvinger (Maia team, LORIA) are extrenal collaborators.*

The MS4SG (multi-simulation for smart grids) project is granted as a strategic action between Inria and EDF. It is a joint work between the Madynes and MAIA teams from Inria-NGE 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. They 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. 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).

The idea behind MS4SG is to use simulation to help develop and evaluate future smart 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 three aforementioned initial different domains: electrical networks, communication networks and information systems.

### **7.1.2. Alerion, project**

**Participants:** Laurent Ciarletta, Maxence Ho, Yael Kolasa, Martin Thiriau, Emmanuel Nataf [contact].

Alerion is an e-falconry startup created by a member of Madynes. Its goal is to provide novel solutions and services “for, using and eventually against” UxV (Unmanned Air ... Vehicle). The concept is to enhance existing system and design new ones by combining well designed components seen as Cyber Physical bricks.

As part of its national grant by the "Concours national d'aide à la création d'entreprises de technologies innovantes" (for the emerging category in 2013), Alerion is funding a Proof of Concept project to help in developing and validating the requirements of a couple of basic components related to functionalities such as safety mechanisms and sensor data collection.

Alerion has also actively supported the UAV Challenge team that participated to the "Outback Joe Challenge".

## MAESTRO Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

MAESTRO members are involved in the

- Inria Alcatel-Lucent Bell Labs joint laboratory: the joint laboratory consists of six ADRs (Action de Recherche/Research Action) in its second phase (starting October 2012). MAESTRO members participate in two ADRs (see §7.1.1 and §7.1.2).
- Inria ALSTOM joint laboratory: the joint laboratory consists of four projects. MAESTRO members participate in project P11 (see §7.1.3).

### 7.1.1. ADR “Self-Organized Networks in Wireless” (October 2012 – December 2015)

**Participants:** Eitan Altman, Majed Haddad.

- Contractor: Alcatel-Lucent Bell Labs (<http://www.alcatel-lucent.com/bell-labs>)
- Collaborators: Laurent Rouillet (coordinator), Véronique Capdevielle.

Coordinator for Inria: Bruno Gaujal (team MESCAL).

During the investigations carried out within this ADR, in collaboration with Alcatel-Lucent Bell Labs and WIRELESS ENB teams (System Engineering and Modem), M. Haddad and E. Altman have proposed three technical solutions to the LTE Mobility State Estimation problem. In particular,

- Three patents have been submitted and filed (two in 2013, and one in 2014);
- A white paper written by the joint team (Inria/Bell-Labs and Wireless SE) summarizing the theoretical baseline of the methods, their performances, as well as the implementation issues, is documented.

These solutions have been set up between Inria and Alcatel-Lucent Bell Labs iteratively after numerous meetings, in order to cope with the product requirements. This work is on-going and has not been submitted for publication yet.

### 7.1.2. ADR “Network Science” (January 2013 – January 2016)

**Participants:** Konstantin Avrachenkov [coordinator], Jithin Kazhuthuvelil Sreedharan, Philippe Nain, Giovanni Neglia, Marina Sokol.

- Contractor: Alcatel-Lucent Bell Labs (<http://www.alcatel-lucent.com/bell-labs>)
- Collaborators: Philippe Jacquet (coordinator), Alonso Silva.

“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 are being analyzed in this ADR “Network Science”. In particular, in the framework of this ADR we are interested in efficient network sampling (see §6.2.3) and models of influence/information propagation over the complex networks (see §6.2.4).

### **7.1.3. Project P11 “Data Communication Network Performance” (December 2013 – May 2016)**

**Participants:** Sara Alouf [coordinator], Konstantin Avrachenkov, Abdulhalim Dandoush, Philippe Nain, Giovanni Neglia.

- **Contractor:** ALSTOM Transport (<http://www.alstom.com/transport/>)
- **Collaborators:** Pierre Cotelle, Pierre Dersin, Sébastien Simoens (coordinator).

The objective of this study is to build a simulation platform (see §5.1.1 ) 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.

## **7.2. Bilateral Grants with Industry**

### **7.2.1. “Multi-Objective Optimization for LTE-Advanced Networks” (December 2012 – November 2015)**

**Participant:** Eitan Altman.

- **Contractor:** Orange Labs (<http://www.orange.com/en/innovation>)
- **Collaborators:** Zwi Altman, Abdoulaye Tall.

The objective of this Cifre thesis is threefold: (1) to develop solutions based on stochastic approximations and optimal control for the optimization and setting of LTE-Advanced Networks; (2) to develop queuing models to capture the dynamics of the traffic and the physical layer mechanisms (e.g. relay, MIMO, scheduling); and (3) to apply the developed methods to engineering problems such the interference management, load balancing, optimization of coverage and capacity, and mobility management.



## **MAGIQUE-3D Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Contracts with TOTAL**

- Depth Imaging Partnership (DIP)  
Period: 2014 May - 2019 April , Management: Inria Bordeaux Sud-Ouest, Amount: 12000 euros/year.
- 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 Grants with Industry

### 7.1.1. *Cifre SAP (2011-2014)*

**Participants:** Thomas Ricatte, Marc Tommasi, Rémi Gilleron [correspondent].

In business intelligence information systems, one of the first tasks is to acquire and clean internal data and then enrich them with additional sources of informations. This preprocessing step is well planned and specialized for fixed analysis and fixed dashboards. The subject of our collaboration with SAP was included in general objective that (i) specializes this preprocessing task in order to deal with external data coming from networked data like social networks and open relational data, and (ii) simplifies the adaptation of the processing step evolving data analysis tasks. We have focused on the task of merging information acquired from many input data sources represented as graphs, with the final objective of providing a unique graph representation of all data or data models. This research has lead to new graph combination algorithms, but has also raised the need for representing and managing high order relations using graph-like techniques.

RÉMI GILLERON supervises the PhD thesis (Cifre) of Thomas Ricatte together with Yannick Cras from SAP.

### 7.1.2. *Cifre Clic and Walk (2013-2016)*

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

We start a one to one cooperation with the CLIC AND WALK company that 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.

MIKAELA KELLER and MARC TOMMASI supervise the PhD thesis (Cifre) of PAULINE WAUQUIER on graph-based recommendation 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.

MAGNOME and a consortium of academic (CNRS, INRA, INSA Toulouse) and industrial (Dassault Aviation, Airbus, Turbomeca, SNECMA, Air France, Total) partners coordinated by the French Institute for Petroleum and New Energies are contracted together on a large program of developing and testing alternative fuels for aviation, funded by the Civil Directorate for Aviation. MAGNOME's role is working with biological partners in developing genomic and genetic tools for oleaginous yeasts used in biofuel production.

## **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, Victorien Elvinger.

*Laurent Ciarletta, Yannick Presse and Benjamin Segault (Madyne 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 Madyne and MAIA team from Inria-NGE 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 and it is needed to re-think the way electricity is supplied to customers and the power supply network regulated.

The simulation approach can be taken to envisage 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: models in these simulators (and therefore simulators softwares) are heterogeneous (at least equation based and event based models), the softwares used are existing ones, etc.

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.

## **MAMBA Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

Collaboration with Merrimack Pharmaceuticals on spatial-temporal modeling of drug action.

## **MANAO Project-Team**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. Bilateral Contracts with Industry**

- CIFRE PhD contract with Technicolor 2 (2014-2018)

**Participants:** A. Dufay, X. Granier, and R. Pacanowski

For this project, we aim at providing interactive previsualization of complex lighting with a smooth transition to the final solution.

## **MARELLE Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### ***7.1.1. Collaboration within the Inria/Microsoft Research Joint Centre***

We participate in the collaboration *Mathematical Components 2* with Microsoft Research. Currently, the main thrust lies around the exploitation of results in the Mathematical Components library, which was our main point of focus until the completion of the proof of the Feit-Thompson theorem.



**MASAIE Project-Team (section vide)**

## **MATHERIALS Team**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. Contracts and Grants with Industry**

Many research activities of the team are conducted in close collaboration with private or public companies: CEA, SANOFI, IRDEP. The 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.

## **MATHRISK Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- Consortium PREMIA, Natixis - Inria
- Consortium PREMIA, Crédit Agricole CIB - Inria

## **7.2. Bilateral Grants with Industry**

- Chair X-ENPC-UPMC-Société Générale "Financial Risks" of the Risk fondation : 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 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. Bilateral Contracts with Industry

Angelo Iollo is consulting with OPTIMAD engineering.

## 7.5. Bilateral 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 started in 2014. 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 account many perturbations 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.

## **MEPHYSTO Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

The team (C. Chainais and A. Gloria) has had its third bilateral contract with ANDRA (French nuclear waste storage agency) from December 2012 to June 2014. The post-doctoral position of T. Gallouët was funded by this contract.

This collaboration concerned mathematical and numerical issues on a corrosion model, and in particular the identification of steady-states and the design of asymptotic-preserving schemes for a free interface problem.



## **MESCAL Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### **7.1.1. *RealTimeAtWork.com***

is a startup from Inria Lorraine created in December 2007. Bruno Gaujal is a founding partner and a scientific collaborator 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 RealTimeAtWork.com

### **7.1.2. *Alcatel Lucent-Bell***

A common laboratory between Inria and the Alcatel Lucent-Bell Labs was created in early 2008 and consists on three research groups (ADR). MESCAL leads the ADR on self-optimizing networks (SELFNET). The researchers involved in this project are Bruno Gaujal and Panayotis Mertikopoulos.

### **7.1.3. *Stimergy***

Stimergy is a startup that aims at developing a distributed data center built by connecting mini data centers embedded in digital boilers installed in multi-unit residential buildings. Each boiler contains several servers and the dissipated power can thus be used to cover a large part of the annual energy requirements for preparing domestic hot water for a building. Such infrastructure drastically reduces the energy required to operate data centers, while reducing total cost of infrastructure and ownership. Mescal (Olivier Richard, and Michael Mercier, full-time Inria engineer) provides the necessary expertise for the realization and implementation of software infrastructure allowing the coordination of operating such mini data center.

## **MEXICO Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts and Grants with Industry**

Our industrial cooperations are currently centered in the IRT SystemX, see below; there are currently no *bilateral* agreements.

## MIMETIC Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. 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.

In 2014, we have developed a testbench based on virtual humans in order to evaluate the expected accuracy of a Kinect sensor in work conditions: the Kinect cannot be placed at a location compatible with the provider's recommendation. This testbench enabled us to evaluate more than 500000 configurations (Kinect location and upper-limb poses) with a virtual mannequin and a simulated Kinect. It will help to design the most appropriate protocol according to the work condition and the poses used by the operators at workstation.

**MIMOVE Team (section vide)**

## **MINT Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### **7.1.1. Autodesk Research (Feb. 2014-Apr. 2014)**

**Participant:** Fanny Chevalier [correspondant].

The correspondant worked with Autodesk Research as a consultant for the Kitty project. The Inria correspondant, Fanny Chevalier, provided scientific advices on the design and evaluation of the prototype of Kitty [23], a sketch-based tool for authoring dynamic and interactive illustrations.

## **MISTIS Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

A contract with the HEMERA company was contracted including the internships of Anne Charlier and Lisa Qianru. Hemera designs, produces and sells online liquid and gaz analyzers. It is located in Grenoble. The aim of Hemera is to measure, in any gaseous or liquid environment, with a minimalized environmental impact and in a selective way, all compounds seen nowadays as pollutants : for our health, for an industrial process, etc. Hemera's analyzers measure gaz concentrations using optical techniques. The goal of the collaboration was to investigate the use of statistical methods to improve both the determination of the present gaz and their respective concentrations from the analysis of spectra representing a mixture of the different gaz. A preliminary study based on the Lasso technique was implemented and tested with promising first conclusions.

**MNEMOSYNE Project-Team (section vide)**

## MOAIS Project-Team

# 6. Bilateral Contracts and Grants with Industry

## 6.1. 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
- Contract with CEA Saclay (2014): Hierarchical work stealing for Eruoplexus. Partners: Moais and CEA Saclay.
- Contract with CEA Bruyères-le-Châtel. (2014): Multi-core and many-core parallelization for scientific visualization. Partners: Moais and CEA Bruyères-le-Châtel.
- Contract with CEA Saclay. (2015): Multi-core and many-core parallelization of EPX code. Partners: Moais and CEA Saclay.
- Contract with Bull (2014-2016): Multi-objective batch scheduling. Partners: Moais and Bull.
- Contract with Incas-ITSec (2014): IPsec with pre-shared key for MISTIC security module. Partners: Moais, Privatics and Incas-ITSec
- Contract with XYALIS (2014): remote software distributed protection (internship support). Partners: Floralis (Moais and UJF-IF [P. Elbaz-Vincent] and XYALIS.

## 6.2. Bilateral Grants with Industry

- Contract with EDF (2010-2014). High performance scientific visualization. Funds 1 PhD (Mathias Ettinger). Partners: Inria (MOAIS and EVASION), EDF R&D.
- Collaboration with CEA (2012-2015): Europlexus Parallelization with XKaapi. Partners: Inria Rhône-Alpes and CEA Saclay (CEA funds the PhD of Marwa Sridi started in 4/2013).
- Contract with IFPEN (2014-2017). Multi-CPU-Multi-GPU parallelization of numerical solvers. Funds 1 PhD (Adrien Roussel). Partners: Inria (MOAIS), IFPEN.



## MODAL Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Arcelor-Mittal

**Participants:** Christophe Biernacki, Clément Théry.

*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 continuous variables and (3) potentially highly correlated variables. A PhD CIFRE grant started on May 2011 on this topic and will finish on 2015.

## 7.2. PGXIS

**Participant:** Christophe Biernacki.

PGXIS is a UK pharmacogenomics company aiming to discover virtual drugs. Its business model relies on its star technology, named Taxonomy3, a ground breaking mathematical method. Applied to Big Genetic Data, it delivers novel drug targets that are biologically confirmed. These drug targets will drive its drug discovery programmes. This six months contract aims at developing mathematical tool for accelerating convergence rate of Taxonomy3. From a scientific point of view, it corresponds to define specific importance sampling methods related to the Monte Carlo process involved in Taxonomy3.

## 7.3. RougeGorge

**Participants:** Christophe Biernacki, Serge Iovleff, Vincent Vandewalle, Vincent Kubicki, Komi Nagbe.

The RougeGorge company sells lingerie item for women. This three months contract aims at defining a new marketing segmentation for customers and also for items. From a scientific point of view, it corresponds to clustering of mixed data, difficulty being provided but the data volume (millions of customers), by the heterogeneity of data (mixed data) and also by many missing data.

## 7.4. Auchan

**Participants:** Christophe Biernacki, Serge Iovleff, Vincent Vandewalle, Vincent Kubicki.

Groupe Auchan SA is a French international retail group and multinational corporation headquartered in Croix. It is one of the world's principal distribution groups with a presence in 12 countries and 269,000 employees. The aim of the two months contracts between Auchan and MODAL is to identify human factors which significantly impact the economical results of the company. From a scientific point of view, it corresponds to regression studies (simple and mixture regression) with missing data and correlated data.

## 7.5. Cap Gemini

**Participants:** Christophe Biernacki, Vincent Vandewalle.

Cap Gemini S.A. is a French multinational corporation headquartered in Paris, with regional activities. It provides IT services and is one of the world's largest consulting, outsourcing and professional services companies with more than 140,000 employees in over 40 countries. The company aims at developing its Big Data ability in regards to its customer needs. A PhD thesis performing specific research to this activity is planned in 2015. In this aim, a preliminary contract has been established since December 2014. It will allow to prepare precisely the research subject.

## 7.6. PIXEO

**Participant:** Christophe Biernacki.

PIXEO is a company allowing online comparisons of insurances. A PhD thesis for optimizing the workflow related to this activity is planned in 2015. In this aim, a preliminary contract has been established since October 2014. It will allow to prepare precisely the research subject. It is a work in collaboration with two members of the Dolphin Inria team (Laetitia Jourdan and Marie-Eléonore Marmion).

## 7.7. 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.

## 7.8. Alicante

**Participants:** Julien Jacques, Cristian Preda, Vincent Vandewalle.

ALICANTE develops applications and tools for data coming from health domain. As a participant of the ClinMine ANR project, ALICANTE and GHICL (Groupe Hospitalier de l'Institut Catholique de Lille) provide us well-structured data for clustering hospital stays.

**MODEMIC Project-Team (section vide)**

## **MOISE Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- A 1-year contract with NOVELTIS on the thematic “Développement de démonstrateurs avec AGRIF”: see [5.1](#)
- 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 (2015-2018) Projet à Partenariat Renforcé SIMBAD (SIMplified Boundary Atmospheric layer moDel for ocean modeling purposes) with the civil private company Mercator-Ocean (coordinator : F. Lemarié)
- A 3-year contract with ARTELIA Group: funding for the PhD thesis of M.P. Daou (CIFRE): see [4.4](#)

**MOKAPLAN Team (section vide)**

**MORPHEME Project-Team (section vide)**

## **MORPHEO Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Contract with Technicolor**

A three year collaboration with Technicolor has started in 2011 and ended in 2014. The objective of this collaboration was to consider the capture and the interpretation of complex dynamic scenes in uncontrolled environments. A co-supervised PhD student (Abdelaziz Djelouah) was working on this subject and will defend his PhD in March 2015.

## MULTISPEECH Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

Besides the contracts listed below, for which MULTISPEECH is officially part of, E. Vincent was involved through his former team (PANAMA) in another 30-month bilateral research contract with Studio MAIA.

### 7.1.1. MAIA

Company: **Studio MAIA**

Duration: September 2014 - August 2015

Supported by: Bpifrance

Abstract: A pre-study contract was signed to investigate speech processing tools that could eventually be transferred as plugins for audio mixing software. Prosody modification, noise reduction, and voice conversion are of special interest.

### 7.1.2. Venatech

Company: **Venathec SAS**

Other partners: **ACOEM Group, GE Intelligent Platforms** (contracted directly with Venathec)

Duration: June 2014 - August 2017

Supported by: Bpifrance

Abstract: The project aims to design a real-time control system for wind farms that will maximize energy production while limiting sound nuisance. This will leverage our know-how on audio source separation and uncertainty modeling and propagation.



## **MUSE Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- “Improving the quality of recommendation using semi-structured user feedback” CIFRE contract with Technicolor for thesis of Sara el Aouad from May 2014 to April 2017.
- “Crowdsourced Home Network Diagnosis” CIFRE contract with Technicolor for thesis of Diego da Hora from February 2014 to January 2017.
- “Exploiting Network Content-awareness to provide novel added value services” contract under the Inria-Alcatel Lucent Bell Labs common Lab (ADR ICN) to fund the doctoral thesis of Giuseppe Scavo from November 2013 to October 2016.
- “Automated Network Troubleshooting Based on Collaboration of Home Devices” CIFRE contract with Technicolor for thesis of Stephene Wustner from Feb 2012 to Nov 2014.

## **7.2. Bilateral Grants with Industry**

- “Home Network Troubleshooting with the Fathom Measurement Platform” in collaboration with Christian Kreibich (ICSI), gift from Google/M-lab, 2013-2014.

**MUTANT Project-Team (section vide)**

**MYCENAE Project-Team (section vide)**

**MYRIADS Project-Team (section vide)**

**NACHOS Project-Team (section vide)**

**NANO-D Project-Team (section vide)**

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## 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 communicating vehicles in urban environment.

### 7.1.2. *ALSTOM*

Contract with ALSTOM in the framework of Inria/ALSTOM joint laboratory, and CIFRE PhD grant of Simon Gerwig. This thesis explores collaborative and reconfigurable resilient control design of hydroelectric power plants; current work is on improving performance of a hydro-electric power-plant outside its design operation conditions, by adaptive cancellation of oscillations that occur in such operation range.

**NEUROMATHCOMP Project-Team (section vide)**



**NEUROSYS Team (section vide)**

## **NON-A Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- Agreement with Sick Company for equipment support of the research in the field of the in-door mobile robot navigation.

## **NUMED Project-Team**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. Bilateral Contracts with Industry**

- Annual contract with Sanofi Pasteur on vaccine fiability (third annual contract, including a 6 months temporary position).
- Four years framework contrat with Servier.

**OAK Project-Team (section vide)**

**OPALE Project-Team (section vide)**

## ORPAILLEUR Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. The BioIntelligence Project

**Participants:** Mehwish Alam, Aleksey Buzmakov, Melisachew Chekol, Adrien Coulet, Marie-Dominique Devignes, Amedeo Napoli [contact person], Nicolas Pépin-Hermann, Malika Smail-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 [47], [48], [49]. The objective is to take advantage of Linked Open Data in biology for helping the biologist for querying and navigating complex data. There are needs to integrate data and knowledge from several web biological resources. At present, some experiments are conducted on designing practical interfaces based on sophisticated visualization tools for allowing human agents to have an easy and quick access to interesting patterns .

A second thesis is based on an extension of FCA involving Pattern Structures on complex data such as sequences and graphs [107]. 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. In addition, a theoretical and practical work was conducted on the evaluation of interest measures for selecting the best concepts to be analyzed by a human agent in a concept lattice, and especially the stability measure in FCA. This led to a series of original and pioneering experiments on this probably underestimated research subject [20], [54], [53].

## 7.2. The Quaero Project

**Participants:** Victor Codocedo [contact person], Ioanna Lykourantzou, 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 project ended at the beginning of 2014). 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 worked on information retrieval, document annotation and recommendation. The objective was to define methods and algorithms for achieving these complex tasks, based on KDDK techniques and especially the FCA technology.

Part of the thesis of Victor Codocedo was prepared in this context, focusing on information retrieval guided by domain knowledge, recommendation and classification of documents w.r.t. sets of annotations using FCA and pattern structures [2] [58], [22].

## PANAMA Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. 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 transferring 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. New PANAMA tools were integrated in the software developed by Imaging Factory and delivered to MAIA in May 2014, and the final release will be delivered in December 2014.

## 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 was to explore, both numerically and theoretically, the potential of compressive sensing for the manipulation of large (audiovisual) databases. A particular objective was 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

# 7. Bilateral Contracts and Grants with Industry

## 7.1. The LearnClues Labcomm

The LearnClues LabComm has been granted on Oct 2.

Statistical learning is a field of mathematics and computer science that enables the extraction of predictive models from data with weak signal to noise ratio. These techniques are behind the successes of Google or the progresses of automatic medical diagnostic. Combined with a knowledge of the field of application, they open the door to optimal decisions. Tynyclues is a start-up that applies statistical learning to e-commerce, adapting the marketing practice from customer databases. Parietal is an Inria research group that develops statistical learning for neurosciences and is the driving force behind the software tool "scikit-learn", that is a standard in statistical learning.

The goal of this proposed common lab is to transfer the expertise of Parietal on big data and to improve statistical learning techniques and implementation on distributed systems to open the door to faster analysis of very large datasets. Indeed, processing more data implies detecting smaller effects in the signals. Tynyclues already uses the tools developed par Parietal on the "cloud", and thus in distributed computing environments. The practical experience of Parietal enables us to plan substantial improvements to computational performance as well as to the amount of information extracted from big data.

From a strategical standpoint for Tynyclues, such progress are important to vary the number of domain scenarios that it can address, by analyzing jointly more data of a wider type, and to render fully automatic the data analysis platform that it is offering to its customers, replacing challenging tasks currently performed by experts. These developments are particularly important given that Tynyclues is developing at a very fast rate and is processing bigger and bigger datasets and an increasing number of different problems.

The project partners are:

- Parietal, Inria
- Tiny Clues

## 7.2. The Wendelin FUI project

The Wendelin project has been granted on December 3rd, 2014. It has been selected at the *Programme d'Investissements d'Avenir (PIA)* that supports "cloud computing et Big Data". It gives visibility and fosters the French technological big data sector, and in particular the scikit-learn library, the NoSQL "NEO" et the decentralized "SlapOS" cloud, three open-source software supported by the Systematic *pôle de compétitivité*.

Scikit-learn is a worldwide reference library for machine learning. Gael Varoquaux, Olivier Grisel and Alexandre Gramfort have been major players in the design of the library and Scikit-learn has then been supported by the growing scientific Python community. It is currently used by major internet companies as well as dynamic start-ups, including Google, Airbnb, Spotify, Evernote, AWeber, TinyClues; it wins more than half of the data science "Kaggle" competitions. Scikit-learn makes it possible to predict future outcomes given a training data, and thus to optimize company decisions. Almost 1 million euros will be invested to improve the algorithmic core of scikit-learn through the Wendelin project thanks to the Inria, ENS and Institut Mines Télécom teams. In particular, scikit-learn will be extended in order to ease online prediction and to include recent stochastic gradient algorithms.

NEO is the native NoSQL base of the Python language. It was initially designed by Nexedi and is currently used and embedded in the main software of company information systems. More than one million euros will be invested into NEO, so that scikit-learn can process within 10 years (out-of-core) data of 1 exabyte size.

Paris13 university and the Mines Télécom institute will extend the SlapOS distributed mesh cloud to deploy Wendelin in *Big Data as a Service* (BDaaS) mode, to achieve the interoperability between the Grid5000 and Teralab infrastructures and to extend the cloud toward smart sensor systems.

The combination of scikit-learn, NEO and SlapOS will improve the predictive maintenance of industrial plants with two major use cases: connected windmills (GDF SUEZ, Woelfel) and customer satisfaction in car sale systems (MMC Rus). In both cases it is about non-personal, yet profitable big data. The Wendelin project actually demonstrates that Big data can improve infrastructure and everyday-life equipment without intrusive data collection. For more information, please see [www.wendelin.io](http://www.wendelin.io).

The project partners are:

- Nexedi (leader)
- GDF SUEZ
- Abilian
- 2ndQuadrant
- Institut Mines Télécom
- Inria
- Université Paris 13

**PARKAS Project-Team (section vide)**

**PARSIFAL Project-Team (section vide)**

**PERCEPTION Project-Team (section vide)**

**PHOENIX Project-Team (section vide)**

**PL.R2 Project-Team (section vide)**

## POEMS Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

Contract POEMS-DGA

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

Start : 09/01/2011, End : 12/31/2015. Administrator : ENSTA.

This contract is about guided waves 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.

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.

Contract POEMS-CEA-LIST

**Participants:** Marc Bonnet, Stéphanie Chaillat, Laure Pesudo.

Start : 12/01/2014, End : 11/31/2017. Administrator : CNRS.

This contract is about the coupling between high frequency methods and integral equations.

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.

Contract POEMS-EDF

**Participants:** Stéphanie Chaillat, Marc Bonnet, Zouhair Adnani.

Start : 12/01/2014, End : 11/31/2017. Administrator : CNRS.

This contract is about fast solvers to simulate soil-structure interactions.

## 7.2. Bilateral Grants with Industry

Contract POEMS-CEA-LIST-DIGITEO

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

Start : 10/01/2011, End : 09/30/2014. Administrator : CEA-LIST.

SIDONIE : SIMulation numérique de la Diffraction d'Ondes ultrasonores par un défaut localisé dans une Plaque aNIotropE



**POLSYS Project-Team (section vide)**

## POMDAPI Project-Team

# 6. Bilateral Contracts and Grants with Industry

## 6.1. Bilateral Contracts with Industry

**RTE** (Réseau de Transport de l'Électricité) and **ANRT** (Association Nationale de la Recherche et de la Technologie) are funding the PhD thesis of C. Josz (Cifre agreement).

**Andra** is funding the PhD thesis of S. Ali Hassan (an agreement that is part of an *accord Cadre* between Inria and Andra).

**IFP Énergies Nouvelles** (*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.

## **POPIX Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

POPIX had a contract with Astrazeneca (November 2011 - November 2014)

POPIX has a contract with Lixoft (June 2011 - June 2015)

## POSTALE Team

# 6. Bilateral Contracts and Grants with Industry

## 6.1. Bilateral Contracts with Industry

- **EDF R& D:** this is a collaboration with the department SINETICS of EDF in the area of high-performance computing.

**Participants:** Marc Baboulin, Grigori Fursin, Amal Khabou.

It concerns two different topics:

- Enhancing performance of numerical solvers using accelerators (postdoc starting in October 2014) and vectorization techniques (internship starting in November 2014).
- Studying numerical quality and reproducibility in HPC exascale applications (ongoing ANR submission).

- **ARM Ltd**

**Participant:** Grigori Fursin.

UK: this collaboration is related to systematizing benchmarking of OpenCL programs for new ARM GPU architectures and applying machine learning to predict better optimizations (Grigori Fursin).

- **Collaboration with the small size company NumScale** (PME, 10 people) NumScale on C++ parallel code generation technology. NumScale is a start-up created in 2012 as the result of a Digiteo/University Paris Sud technological transfer program (Digiteo OMTE). NumScale exploits scientific results and tools based around code generation for parallel programs as well as advanced code optimization techniques developed by members of the team.

## **POTIOC Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### **Interactive Collaboration in Virtual Reality for Aerospace Scenarii:**

- duration: 2014-2017
- PhD Thesis of Damien Clergeaud
- partners: Airbus Group Innovations, Airbus Defence & Space
- The objective of this work is to explore the problems of remote collaboration in the context of virtual reality for aerospace applications. It relates to an interaction between an immersed user and remote operators equipped with various communication tools (desktop computers, tablets, touch tables...) or an interaction between a user and a remotely operated robot.

## **PRIMA Project-Team**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. Infrared Visual Sensors**

PRIMA has worked with Schneider Electric on embedded image analysis algorithms for a new generation of far-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 and human activity.

## PRIVATICS Project-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 platform 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.

### 6.1.2. IPsec with pre-shared key for MISTIC security

Title: IPsec with pre-shared key for MISTIC security.

Type: CIFRE.

Duration: Juillet 2014 - Juillet 2017.

Coordinator: Inria

Others partners: Privatics, Moais and Incas-ITSec.

**PROSECCO Project-Team (section vide)**



**QUANTIC Team (section vide)**

## **RAP Project-Team**

# **5. Bilateral Contracts and Grants with Industry**

## **5.1. Contracts**

- CELTIC-Plus Saser “Safe and Secure European Routing”. RAP participates in the section on optical networks. Participants include Orange labs, Alcatel-Lucent, Telecom Institute, ENSSAT as well as a number of German laboratories. Duration three years.
- Contrat de recherche externalisé avec ORANGE SA "Scheduling Global OS". Duration three years 2014-2016.
- 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.
- 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.
- PhD grant from Fondation Sciences Mathématiques de Paris for Wen Sun.
- PhD grant from Brazilian Government for Guilherme Thompson.

## **5.2. Bilateral Grants**

- The project RNA “Connectivity and distances in models of random networks and applications” is jointly funded by Inria through the Associate Team program, and Quebec’s FQRNT team grant CARP. <https://who.rocq.inria.fr/Nicolas.Broutin/aap-rna.html>. Duration 2013-2014.

## **REALOPT Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Contract with EDF on robust 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. We previously developed a column generation approach based on extended formulation which enables to solve within a few minutes a deterministic instance of the problem, which is within the time frame of the operational tools currently used by EDF. We now investigate stochastic and robust versions of the problem, where the duration of maintenance operations and the power demand are uncertain. Our approach is tested on real life instances within a rolling horizon framework.

## **7.2. Collaboration with ERTUS on phytosanitary treatment planning**

In planning winery operations (most importantly phytosanitary treatments on the wine tree) under weather forecast 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 scheduled 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 treatments while guarantying a disease free vineyard with some confidence. Each of the scheduled tasks requires its own resource, so the planning also triggers equipment 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.

### **7.6. Collaboration with Renault S.A. on truck loading problem**

The goal of this one year industrial contrat was to analyze the algorithmic solutions used by Renault S.A. for packing items into trucks. The outcome of the contract was a report on their approach and how hints to improve it.

### **7.7. Collaboration with St-Gobain Recherche on glass cutting**

Through the internships of Quentin Viaud, we have studied a hard glass-cutting problem. The objective is to minimize the quantity of trim loss when rectangular pieces are cut from large rectangles. This first study has shown that our methodologies are able to cope with this problem for medium-sized instances. Solving the problem with large instances is a scientific challenge that we will address in the a follow-up contract. Quentin Viaud has begun a PhD thesis (CIFRE) in 2015 on this topic.

## REGAL Project-Team

# 6. Bilateral Contracts and Grants with Industry

## 6.1. Bilateral Contracts with Industry

- Orange Lab, 30,000 euros for 1 PhD Students (CIFRE), Raluca Diaconu
- Renault, 60,000 over 3 years (2013 - 2016) for a CIFRE. In the context of a Cifre cooperation with Renault, we are supervising with Whipser 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 industrial PhD: CRDTs for Large-Scale Storage Systems, with Scalify SA*

We have started a joint CIFRE (industrial PhD) research with the French start-up company **Scalify**, as described above (under “Large-Scale File Systems”).

The objective of this research is to design new algorithms for file and block storage systems, considering both the issues of scaling the file naming tree to a very large size, and the issue of conflicting updates to files or to the name tree, in the case of high latency or disconnected work.

### 6.2.2. *EMR CREDIT, with Thales.*

Franck Petit and Swan Dubois participate to the creation of the EMR (Equipe Mixte de Recherche) *CREDIT*, (Compréhension, Représentation et Exploitation Des Interactions Temporelles) between LIP6/UPMC and Thales.

Nowadays, networks are the field of temporal interactions that occur in many settings networks, including security issues. The amount and the speed of such interactions increases everyday. Until recently, the dynamics of these objects was little studied due to the lack of appropriate tools and methods. However, it becomes crucial to understand the dynamics of these interactions. Typically, how can we detect failures or attacks in network traffic, fraud in financial transactions, bugs or attacks traces of software execution. More generally, we seek to identify patterns in the dynamics of interactions. Recently, several different approaches have been proposed to study such interactions. For instance, by merging all interactions taking place over a period (e.g. one day) in a graph that are studied thereafter (evolving graphs). Another approach was to built meta-objects by duplicating entities at each unit of time of their activity, and by connecting them together.

The goal of the EMR is to join both teams of LIP6 and Thales on these issues. More specifically, we hope to make significant progress on security issues such as anomaly detection. This requires the use of a formalism sufficiently expressive to formulate complex temporal properties. Recently, a vast collection of concepts, formalisms, and models has been unified in a framework called Time-Varying Graphs. We want to pursuit that way. In the short run, the challenges facing us are: (1) refine the model to capture some interaction patterns, (2) design of algorithms to separate sequences of interactions, (3) Identify classes of entities playing a particular role in the dynamics, such as bridges between communities, or sources and sinks.

## **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.
- Hadopi contract on the economical feasibility of a way to reduce pirating of cultural goods on the Internet.

## **REO Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Grants with Industry**

### **7.1.1. CIFRE convention**

**Participants:** Céline Grandmont, Nicolas Pozin, Irène Vignon-Clementel.

CIFRE convention and contract with Air Liquide Santé International in the context of the ANRT on “Multiscale lung ventilation modeling in health and disease”, for the PhD thesis of Nicolas Pozin (March 2014 - February 2017).

## **REVES Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### **7.1.1. Autodesk**

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

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

## **7.2. Bilateral Grants with Industry**

### **7.2.1. Adobe**

**Participants:** George Drettakis, Gaurav Chaurasia.

Adobe has offered a small donation in the context of our collaboration on compilers for image processing (Sec. [6.2.2](#)).



## RITS Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

- *Valeo Group*: a very strong partnership is under reinforcement between Valeo and Inria. Several bilateral contracts were signed to conduct joint works on Driving Assistance. Valeo financed the PhD thesis of G. Trehard under the framework of Valeo internal project “V50” and is currently a major financing partner of the “GAT” international Chaire / JointLab. Technology transfer is also a major collaboration topic between RITS and Valeo.
- *GAT JointLab*: Inria is a main partner of this Joint Lab which is composed of Valeo, SAFRAN, Peugeot-Citroën, Inria, Armines and IFSTTAR. GAT will focus on the development of Automated driving architectures for implementation on real prototypes equipped with near-to-market sensors provided by the industrial partners.
- *AKKA Technologies*: a strong partnership was born as a result of Link & Go project funded by the Yvelines Department CG78. The Link & Go has become a common platform for development between Inria and AKKA. These two institutions are now partners in several research projects and established a roadmap for joint developments around the automatic full-by-wire driving.
- *ROBOSOFT – EasyMile*: Robosoft is a spin-off of Inria created in 1985. Partners in several national and European research programs, RITS and Robosoft share the same vision on the automated urban transportation needs and modalities. They coped on the design and development of the Cycab and are currently collaborating – together with EZ Mile – on the development of on-demand automated transportation based on automated shuttles; this includes technology transfer especially in laser-based navigation systems.
- *YAMAHA Motor Company (YMC)*: a MoU was signed in 2012 between YMC and RITS giving the two parties the framework to work on the *New generation of AGV*. The previous similar cooperation (2000-2010) led to a 750 000 Euros financing program that allowed the development of several AGV platforms. The new agreement settles the basis of more advanced collaboration more focused on machine intelligence and on the design of innovative electric AGV dedicated to mass transportation in urban areas. The EU-CityMobil-2 project is an ideal opportunity to maintain technical exchanges within the cooperation.
- *AXTER Automation*: RITS has signed a MoU with AXTER Technologies for the cooperation on the autonomous navigation in indoor environments for automated industrial vehicles.
- *YoGoKo*: This is the newly created spin-off of RITS team. It has been created by Thierry Ernst, previous researcher of RITS and the initiator of the telecommunications activities in the team. YoGoKo is specialized in the design and development of V2X telecommunication architectures and software based on recent IETF internet protocols (e.g., IPv6) and cooperative ITS norms of ISO/CEN/ETSI. RITS is equipping its mobile prototypes with YoGoKo’s products and they are solid partners in French research programs.

## RMOD Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. 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.

## 7.2. Sponsoring LAM

**Participants:** Stéphane Ducasse [Correspondant], Marcus Denker.

**Contracting parties:** Inria, LAM Research, Inc.

LAM Research Inc. (<http://lamrc.com>) is a leading supplier of wafer fabrication equipment and services to the global semiconductor industry. LAM has started to sponsor RMOD in 2014. RMOD used the sponsored funds to pay student internships in 2014.

## 7.3. Resilience FUI

**Participants:** Stéphane Ducasse [Correspondant], Nicolas Petton, 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.

We proposed to use WebWorkers as a way to control DOM edition. 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. We proposed a digest of the semantics of JavaScript centered around security concerns.

## 7.4. Worldline CIFRE

**Participants:** Anne Etien [Correspondant], Nicolas Anquetil, Stéphane Ducasse, Vincent Blondeau.

In the context of a CIFRE PhD we are working on large industrial project characterization. The PhD started in October 2014.

## 7.5. Pharo Consortium

The Pharo Consortium was founded in 2012 and is growing constantly. As of end 2014, it has 14 company members, 10 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 the evolutions and support of the MUMPS solver (see Section 5.1), we worked on:

- setting up a consortium of industrial users to fund the project. Four membership contracts were signed this year by Altair, EDF, LSTC and Michelin.
- a contract with EMGS (Norway) related to low-rank compression for geophysics applications; the contract is managed by INP Toulouse.

## **RUNTIME Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. 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 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 CEAI 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 (section vide)**

## **SCALE Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### **7.1.1. Amadeus**

Duration: May 2014 - April 2015

Inria teams: Scale, Coati

Abstract: This collaboration aims to assess the benefits that digital technologies can bring in complex travel distribution applications. Indeed, these applications require both high performance algorithms and distributed programming methods to search for the best solutions among billions of combinations, in a very short time thanks to the simultaneous use of several hundreds (if not thousands) of computers. These benefits will be demonstrated in an application to build 'of the shelf' optimized packages, fully customized to best meet the complex demands of the traveler.

## **SECRET Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

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

## **7.2. Bilateral Grants with Industry**

- **Thales** (02/14 → 01/17)  
*Funding for the supervision of Julia Chaulet's PhD.*  
30 kEuros.

## **SELECT Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Contract with SNECMA**

**Participants:** Gilles Celeux, Rémy Fouchereau, Patrick Pamphile.

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

## **7.2. Contract with Thales**

**Participants:** Erwan Le Pennec, Michel Prenat, Solenne Thivin.

SELECT has a contract with Thales Optronique on target detection on complex backgrounds.



**SEMAGRAMME 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.

- **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.

## 7.2. Bilateral Grants with Industry

- **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 Hoai Nam Nguyen (2013-2016).

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## SHACRA Project-Team

# 6. Bilateral Contracts and Grants with Industry

## 6.1. 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 Stéphane 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.

## 6.2. Bilateral Grants with Industry

The collaboration is set 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**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. Bilateral Contracts with Industry**

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 challenges 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).

Technicolor, CIFRE PhD student: "User profiling from unstructured data".

## **6.2. Bilateral Grants with Industry**

A. d’Aspremont, AXA, "mécénat scientifique, chaire Havas-Dauphine", machine learning.

A. d’Aspremont, Société Générale - fondation ENS, "mécénat scientifique".

A. d’Aspremont, Scientific committee, Thales Alenia Space. Evaluation program in control, signal processing, etc.

A. d’Aspremont, Projet EMMA at Institut Louis Bachelier. Collaboration with Euroclear on REPO markets.

## **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 : § 6.3.2 .
- 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 know to which extent the learned dictionaries can allow detecting the modulation transfer function (MTF) used to characterize the quality of electro-optical imaging systems on board remote sensing satellites.

## **7.2. Bilateral Grants with Industry**

### **7.2.1. 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-Mar.14.

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.

### **7.2.2. CIFRE contract with Orange on Generalized lifting for video compression**

**Participants:** Christine Guillemot, Bihong Huang.

- Title : Generalized lifting for video compression.
- Research axis : § 6.3.3 .
- 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.

### **7.2.3. 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 developing 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 accurately 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.

### **7.2.4. 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.

### **7.2.5. 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.

### **7.2.6. 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 : § 6.3.3 .
- 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.

### **7.2.7. CIFRE contract with Envivio on LDR compatible HDR video coding**

**Participants:** Christine Guillemot, David Gommelet, Aline Roumy.

- Title : LDR-compatible coding of HDR video signals.
- Research axis : § 6.3.3 .
- Partners : Envivio.
- Funding : Cifre Envivio.
- Period : Oct.2014-Sept.2017.

The goal of this Cifre contract is to design solutions for LDR-compatible coding of HDR videos. This involves the study of rate-distortion optimized tone mapping operators taking into account constraints of temporal coherency to avoid the temporal flickering which results from a direct frame-by-frame application of classical tone mapping operators. The goal is also to design a coding architecture which will build upon these operators, integrating coding tools tailored to the statistics of the HDR refinement signals.



## **SISTM Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

Roche Institute, through the Vaccine Research Institute, funding one engineer over 2 years (2012-2014)

Cytheris (now RevImmune), through the ANRS, for the development of IL-7, as this is the only one company able to produce exogeneous IL-7 usable in Humans.

## SISYPHE Project-Team

# 6. Bilateral Contracts and Grants with Industry

## 6.1. SciWorks Technologies contract: development of K-Assessor

**Participants:** Habib Jreige, Michel Sorine.

*Development of K-Assessor.* This contract ended in November 2014. The software K-Assessor has been developed with SciWorks Technologies for the monitoring and supervision of *master GC*, a prototype system of Fresenius-Kabi dedicated to glycemic control assistance based on the control algorithm CGAO\_v2, we have previously developed [43].

*Distribution of ISTL.* ISTL is a software that we developed for numerical computation of the inverse scattering transform for electrical transmission lines. In addition to the inverse scattering transform, it includes a numerical simulator generating the reflection coefficients of user-specified transmission lines. With the aid of a graphical interface, the user can interactively define the distributed characteristics of a transmission line. ISTL is now distributed by [SciWorks Technologies](#).

## 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€.

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. 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. This project is being audited by ARS-Ile de France (the Regional Healthcare Agency) and CG78 (General Council of Yvelines District), in order to envision the opportunity of a larger deployment.

## 7.3. Cozy Cloud bilateral contract (Dec 2014 - Nov. 2015)

Partners: Cozy Cloud, Inria-SMIS

SMIS funding: 50k€.

Many personal data end up today on servers where they can be scrutinized by companies and governmental agencies. To face this situation, the most emblematic initiative is the Personal Cloud paradigm. Roughly speaking, the Personal Cloud is an architecture which gives users the ability to store their complete digital environment, synchronize it among various devices and share it with other users and applications under their control. It reflects the expectation of the individuals for the emergence of privacy-by-design next-generation storage and computing services. Cozy Cloud is a French startup providing such a personal Cloud platform. The Cozy product is a software stack that anyone can deploy to run his personal server in order to host his personal data and web services. Cozy defines itself as the "Android of personal servers". While centralizing all personal data in the holder's hand is a natural way to reestablish his control on his privacy, this represents an unprecedented threat in case of attacks by an intruder, especially for individuals who are not security experts. The objective of this bilateral contract is typically to address this issue by integrating the PlugDB solution into the Cozy stack. Roughly speaking, the Cozy data system will be modified in such a way to store only encrypted files and each file access will be intercepted and routed to PlugDB. PlugDB will act as a doorkeeper for the whole individual dataspace by managing the files' metadata, the access control rules defined on these metadata, the decryption keys and the user/application authentication.

#### **7.4. Cozy Cloud CIFRE contract (Oct 2014 - Sept 2017)**

Partners: Cozy Cloud, Inria-SMIS

SMIS funding: 30k€.

In relation with the bilateral contract mentioned above, a CIFRE PhD thesis has been started by Paul Tran Van. The objective is to capitalize on the Cozy-PlugDB platform to devise new access and usage control models to exchange data among devices of the same user (devices may have different levels of trustworthiness) and among different users. A particular focus will be put on the enforcement of the access and usage control rules in this thesis.

## **SOCRATE Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

Socrate has strong collaboration 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 french young 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 with Bosch on arithmetic for automotive embedded platforms involves Florent de Dinechin and members of the AriC team.

## **SPADES Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- With Orange Labs: software architecture for GlobalOS

## **7.2. Bilateral Grants with Industry**

- ST Microelectronics: CIFRE contract for the PhD of Vagelis Bebelis. This work is described in Section [6.2.1](#).

## **SPECFUN Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

**Mathematical Components** (project of the MSR–INRIA Joint Centre).

Goal: Investigate the design of large-scale, modular and reusable libraries of formalized mathematics, 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: F. Chyzak, A. Mahboubi, E. Tassi.

Website: <http://www.msr-inria.fr/projects/mathematical-components/>.

## SPIRALS Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. ip-label

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

A software exploitation licence of the APISENSE<sup>®</sup> crowdsensing platform has been sold to the ip-label company. They use 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 GSM connection depending on their location.

## 7.2. Microsoft Windows Azure for Research Grant

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

The research program associated with this grant consists in leveraging the APISENSE<sup>®</sup> crowdsensing platform to support the real-time processing of "big" datasets collected in the physical world by a "large" crowd of smartphones. Examples of case studies covered in this area include the automatic inference of roadmaps, the continuous cartography of network coverage quality, or even the detection and the dynamic analysis of earthquakes. However, the unpredictable volume of data to be collected in the wild requires the adoption of elastic computation models and infrastructures to continuously provision the processing capabilities to fit uploads of information reports.

The grant takes the form of virtual credits for accessing the Microsoft Azure cloud computing platform.

## 7.3. Orange Labs

**Participants:** Laurence Duchien [correspondant], Amal Tahri.

This collaboration aims at bridging the gap between home networks and cloud environments for the design, the provisioning and the administration of distributed services. The purpose is to define solutions, essentially software design tools and runtime infrastructures, for the seamless migration of distributed applications and services between home networks and cloud environments. The envisioned approach is based on the research activities that we are conducting in the domain of software product lines.

This collaboration is conducted in the context of the ongoing PhD thesis of Amal Tahri.



## **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 based on RGBD sensors with very low rate of false alarms.

## **STEPP 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 one contract with EADS Astrium Satellites (now Airbus Defence and Space), where we appear as sub-contractor: DECSA (DGA).

## **SUMO Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

Several researchers of Sumo are involved in the joint research lab of Alstom and Inria, in a common research team called P22. On Alstom side, this joint research team involves researchers of the ATS division (Automatic Train Supervision). The objective of this joint team is to evaluate regulation policies of urban train systems, to assess their robustness to perturbations and failures, to design more efficient regulation policies and finally to provide decision support for human regulators. The project started in march 2014, and a second phase of the project will start in march 2015, for a duration of three years. This covers in particular the PhD of Karim Kecir.

**TACOMA Team (section vide)**

## TAO Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

- **Thalès Air Systems** (corr. Areski Hadjaz)– 2011-2014 (45 kEuros)  
Related to Gaétan Marceau-Caron’s CIFRE PhD  
Participants: Marc Schoenauer
- **Thalès Research & Technology** (corr. Johann Dreo)– 2014-2017 (30 kEuros)  
Related to Nacim Belkhir’s CIFRE PhD  
Participants: Marc Schoenauer
- **Modyrum (Modélisation Dynamique d’un Réseau Médiatique, related to Marco Bressan’s postdoc SME Augure – 2013-2015 (150 kEuros)**  
Participants: Philippe Caillou, Cyril Furtlehner, Michèle Sebag
- **I-Lab METIS (A general framework for decision making with uncertainty plus energy-specific applications) ARTELYS – 2011-2014 (40 kEuros)**  
Related to Jérémie Decock’s PhD  
Participants: Jérémie Decock, Jean-Joseph Christophe, Olivier Teytaud.

## **TASC Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Grants with Industry**

### **7.1.1. *Gaspard Monge***

**Participants:** Nicolas Beldiceanu, Helmut Simonis.

Title: Gaspard Monge 2.

Duration: 2014.

Type: **continuation of 2012,2013 project.**

Budget: 6000 Euros.

Others partners: EDF.

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.

## **7.2. Bilateral Contracts with Industry**

### **7.2.1. *Labcom TransOp***

**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**. The project is managed by **Xavier Lorca**.

## TEA Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. Toyota Info-Technology Centre (2014-2016)

Title: Co-Modeling of Safety-Critical Multi-threaded Embedded Software for Multi-Core Embedded Platforms

Inria principal investigator: Jean-Pierre Talpin

International Partner (Institution - Laboratory - Researcher):

Virginia Tech Research Laboratories, Arlington (United States)

Embedded Systems Group, Technische Universität Kaiserslautern (Germany)

Duration: 2014 - 2016

Abstract: We started a new project in April 2014 funded by Toyota ITC, California, to work with Huafeng Yu (a former post-doctorate of team ESPRESSO) and with VTRL as US partner. The main topic of our project is the semantic-based model integration of automotive architectures, virtual integration, toward formal verification and automated code synthesis. This year, Toyota ITC is sponsoring our submission for the standardisation of a time annex in the SAE standard AADL.

In a second work-package, we aim at elaborating a standardised solution to virtually integrate and simulate a car based on heterogeneous models of its components. This year, it will be exemplified by the elaboration of a case study in collaboration with Virginia Tech. The second phase of the project will consist of delivering an open-source, reference implementation, of the proposed AADL standard and validate it with a real-scale model of the initial case-study.

**TEMPO Team (section vide)**



## TITANE Project-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.

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 collaboration was 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 Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. *ProofInUse Joint Laboratory*

**Participants:** Claude Marché [contact], Jean-Christophe Filliâtre, Andrei Paskevich.

ProofInUse is a joint project between the Toccata team and the SME AdaCore. It was selected and funded by the ANR programme “Laboratoires communs”, starting from April 2014, for 3 years <http://www.spark-2014.org/proofinuse>.

The SME AdaCore is a software publisher specializing in providing software development tools for critical systems. A previous successful collaboration between Toccata and AdaCore enabled *Why3* technology to be put into the heart of the AdaCore-developed SPARK technology.

The goal is now to promote and transfer the use of deduction-based verification tools to industry users, who develop critical software using the programming language Ada. The proof tools are aimed at replacing or complementing the existing test activities, whilst reducing costs.

### 7.1.2. *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 3-year bilateral collaboration contract, that ended in April 2014.

The aim was 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 [84]. A focus was made on programs involving Ada containers [85]. C. Dross defended her PhD in April 1st 2014 [14].

## 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, for 2 years starting from Dec. 2012 The goal of this project is to develop a new version of Cubicle with significantly improved model-checking power. This required innovative algorithmic enhancements to be implemented and evaluated.

Partner: Intel Strategic Cad Labs in Hillsboro, OR, USA

## **TONUS Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

We are participating to a project with company AxesSim in Strasbourg. The objective is to help to the development of a commercial software for the numerical simulation of electromagnetic phenomena. The applications are directed towards antenna design and electromagnetic compatibility. This project is partly supported by DGA through "RAPID" (régime d'appui à l'innovation duale) funds. The CIFRE PhD of Thomas Strub is part of this project. Another CIFRE PhD will start in AxesSim on the same kind of subjects in March 2015.

## **TOSCA Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- TOSCA Nancy had a bilateral contract coordinated by M. Deaconu with the SME Alphability on financial risk measures with applications in portfolio management. This collaboration will be continued in 2015.
- M. Deaconu is involved in a bilateral contract with Venathec. She is supervising, with E. Vincent (EPI PAROLE), the Ph.D. Thesis of B. Dumortier on the acoustic control of wind farms noise.

## **7.2. Bilateral Grants with Industry**

- TOSCA Sophia is involved in a Cifre convention with Koris International. M. Bossy supervises M. Bonelli's Ph.D. thesis.

### ***7.2.1. Promotion of Mathematics in the industry***

- M. Deaconu was invited to give a talk at the Workshop *Modélisation et Simulation Numérique - Applications, Enjeux, Besoins, Interactions Laboratoires/Entreprises*, on November 25 in Nancy.
- D. Talay continued to serve as 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 continued to serve as a member of the Scientific Committee of the AMIES National Agency aimed to promote interactions between Mathematics and Industry.

**TYREX Project-Team (section vide)**

## **URBANET Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- We have contracted bilateral cooperation with some industrial partners that are under non disclosure agreements and cannot be mentioned here.

**VEGAS Project-Team (section vide)**

## VERIDIS Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Project Funded by the Airbus 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 6.3, 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.

## 7.2. ADN4SE Project

**Participant:** Stephan Merz.

*Joint work with Damien Doligez of Inria Paris Rocquencourt and Jael Kriener and Tomer Libal at the Joint MSR-Inria Centre.*

The ADN4SE project started in 2013 within *Programme d'Investissements d'Avenir: Briques Génériques du Logiciel Embarqué* and is coordinated for Inria by the Gallium team in Rocquencourt. The objective of this project is to develop and commercialize the PharOS real-time micro-kernel operating system. In cooperation with researchers at CEA List, we are contributing to the project by verifying key properties (in particular, determinism) of a high-level model of the system written in TLA<sup>+</sup>.



## **VIRTUAL PLANTS Project-Team**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. Bilateral Grants with Industry**

Maryline Lievre has been funded by Bayer grant. Guillaume Garin has been funded by ITK. The Hydroroot project is funded by Syngenta.

## 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 is a major advance in the collaboration since it will enable the development of MRI sequences on site.

## 7.2. Bilateral Grants with Industry

### 7.2.1. MEDday

As part of its activities, MEDday led the final testing phase on patients diagnosed from Multiple Sclerosis in order to find treatment of progressive multiple sclerosis. This is done in partnership with several hospitals in France. The goal is to achieve an effective treatment for this disease. The role of the team in this industrial grant is to develop new algorithms to perform the processing and the analysis of the images from this study.

## **WHISPER Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

A 5-month contract with the company Metaware to provide support for Metaware's use of Coccinelle ended in February 2014. This contract resulted in numerous improvements in Coccinelle of interest to the general Coccinelle user community, including better handling of declarations involving multiple variables and better pretty printing of the generated code.

The PhD of Koutheir Attouchi [10] on managing resources in the context of Smart Home gateway was supported by a CIFRE grant with Orange Labs.

Together with Julien Sopena from REGAL, we are collaborating with Renault, in the context of the PhD of Antoine Blin (CIFRE), on hierarchical scheduling in multicore platforms for real-time embedded systems. This work is a dissemination of our previous research on the Bossa domain-specific language [6].

## **WILLOW Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. 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 2018 video will account for 80-90% 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.

## **7.2. 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. Bilateral Grants with Industry**

We have a PhD Thesis grant with Alcatel Lucent Bell Labs on *Linked Data Based Exploratory Search*.

We also have a PhD Thesis grant with Synchronext on *Assistant Conversational Agents with Natural Language and Intuition*.

## 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 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 Masegla, Esther Pacitti.

This project aims at developing 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 have developed is now able to extract knowledge from the whole set of distributed data, while avoiding centralization, and guaranteeing data privacy for all peers. The work is currently the subject of a patent between EDF and Inria (patent number in progress).

## 7.3. Triton I-lab (2014-2016)

**Participants:** David Fernandez, Houssein-Eddine Chihoud, Didier Parigot.

Triton is a new common lab. (i-lab) created between Zenith and Beppeers ([beppeers.com](http://beppeers.com)) to work on a platform for developing social networks in mobile/Web environments. The main objective of this project is to design and implement a new architecture for bepeers applications to move to the scale. This new architecture will build on our SON middleware and new NoSQL database technologies, especially graph databases.