Activity Report 2013

Section Contracts and Grants with Industry

<p style="text-align: center; color: red;">**ARIC Project-Team**</p>

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Contract with STMicroelectronics

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

7.1.2. Collaboration with Bosch

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

7.1.3. Collaboration with Intel

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

7.2. Bilateral Grants with Industry

7.2.1. Kalray CIFRE PhD Grant

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

7.2.2. Orange Labs PhD Grant

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

COMPSYS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Tirex Contract with Kalray

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

7.2. ManycoreLabs Project with Kalray

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

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

7.3. Technological Transfer Towards Zettice Start-Up

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

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

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

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

CONVECS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

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

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

DICE Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Dice has bilateral contracts with three companies.

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

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

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

PRIVATICS Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. XDATA

Title: XDATA.

Type: FUI.

Duration: April 2013 - April 2015.

Coordinator: Data Publica

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

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

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

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- With ST Microelectronics: CIFRE contract for the PhD of Vagelis Bebelis. This work is described in Section 6.2.6 .

- With ARGOSIM SA: "Study and transfer contract" for the development by Bertrand Jeannet and the cession to ARGOSIM of the PolyCart library. PolyCart is a library for the manipulation of cartesian products of polyhedra and intervals.

<p style="text-align: center; color: red;">**BIPOP Project-Team**</p>

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

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

Participant: Florence Bertails-Descoubes.

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

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

Participants: Florence Bertails-Descoubes, Gilles Daviet.

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

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

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

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

MISTIS Project-Team (section vide)

NANO-D Team (section vide)

NECS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. IFPEN

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

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

OPALE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

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

BAMBOO Project-Team (section vide)

BEAGLE Project-Team (section vide)

DRACULA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

IBIS Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Genostar

Participant: François Rechenmann.

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

6.2. BGene

Participant: Johannes Geiselmann.

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

MOISE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts with Industry

- A 3-year contract with EDF: project MeCSiCo (coupling methods for the simulation of river flows): see 4.4

- A 3-year contract with ARTELIA Group: funding for the PhD thesis of M.P. Daou (CIFRE): see 4.4

- A 2-year contract with ADEME and MAIA EOLIS on the thematic "Stochastic Downscaling Method": see 5.4 .

- A 4-year contract named ReDICE (Re Deep Inside Computer Experiments) with EDF, CEA, IRSN, RENAULT, IFP on the thematic computer experiments

- A 3-year contract with CEA Cadarache related to Simon Nanty's PhD.

- A 1-year contract with IFREMER on the thematic "Online degradation using the AGRIF software": see 5.1

NUMED Project-Team

5. Bilateral Contracts and Grants with Industry

5.1. Bilateral Contracts with Industry

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

STEEP Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

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

AVALON Team (section vide)

DANTE Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- A bilateral contract has been signed between the DANTE Inria team and ACT750 to formalise their collaboration in the context of churn prediction.

- A bilateral contract has been signed between the DANTE Inria team and KRDS to formalise their collaboration in the context of Facebook marketing / cascade analysis.

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

7.2. Inria Alcatel-Lucent Bell Labs joint laboratory

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

Network Science

The main scientific objectives of network science are:

- to design efficient tools for measuring specific properties of large scale complex networks and their dynamics;

- to propose accurate graph and dynamics models (*e.g.*, generators of random graph fulfilling measured properties);

- to use this knowledge with an algorithmic perspectives, for instance, for improving the QoS of routing schemes, the speed of information spreading, the selection of a target audience for advertisements, etc.

The ADR will focus on:

- Network sampling

- Epidemics in networks

- Search in networks

- Clustering of networks

- Detecting network central nodes

- Network evolution and anomaly detection

MESCAL Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts with Industry

7.1.1. Real-Time-At-Work

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

7.1.2. ADR Selfnets with Alcatel

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

MOAIS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

7.2. Bilateral Grants with Industry

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

ROMA Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

- Total/Hutchinson. In this contract, we worked more specifically on numerical aspects related to rank detection and null-space computations. This feature will be available in a future version of the solver.

- ESI-Group. We worked on modified pivoting strategies for hard symmetric indefinite problems. The proposed solutions could be validated by the industrial partner. This feature will be available in the next release of our package.

SOCRATE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

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

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

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

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

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

<h1 style="text-align:center;color:red;">E-MOTION Project-Team</h1>

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. *Toyota Motors Europe*

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

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

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

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

6.1.2. *Renault*

[Jan 2010 - Feb 2013]

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

6.1.3. *PROTEUS*

[November 2009 - October 2013]

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

The project works on three main aspects :

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

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

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

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

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

6.2. Bilateral Grants with Industry

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

6.3. National Initiatives

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

[Nov 2010 - Nov 2014]

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

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

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

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

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

6.3.2. *ADT P2N*

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

EXMO Project-Team (section vide)

IMAGINE Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts and Grants with Industry

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

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

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

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

Participants: Jean-Claude Léon, Aarohi Johal.

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

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

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

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

7. Bilateral Contracts and Grants with Industry

7.1. MBDA Aerospatiale

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

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

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

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

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

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

Participants: Julien Mairal, Zaid Harchaoui.

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

7.4. Xerox Research Center Europe

Participants: Zeynep Akata, Zaid Harchaoui, Cordelia Schmid.

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

MAVERICK Project-Team (section vide)

MORPHEO Team

7. Bilateral Contracts and Grants with Industry

7.1. Contract with Technicolor

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

PERCEPTION Team (section vide)

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

Participants: Lucas Nacsa, James Crowley [correspondant].

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

TYREX Team (section vide)