Activity Report 2014

Section Contracts and Grants with Industry

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.

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 Darte 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).

DICE Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

DICE has bilateral contracts with two large 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.

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.

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Tirex 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.

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 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.

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.

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 .

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)

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.

NANO-D Project-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.

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.

OPALE Project-Team (section vide)

BAMBOO Project-Team (section vide)

BEAGLE Project-Team (section vide)

<p style="text-align:center;color:red;font-weight:bold;">DRACULA Project-Team</p>

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.

<p align="center" style="color:red">IBIS Project-Team</p>

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/.

KALIFFE 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

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

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.

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

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

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.

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.

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.

<p style="text-align:center">**MOAIS Project-Team**</p>

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 Bulll (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 Rhônes-Alpes and CEA Saclay (CEA funds the PhD of Marwa Sridi started in 4/2013).

- Contract with IFPEN (2014-2017). Multi-CPUs-Multi-GPUs parallelization of numerical solvers. Funds 1 PhD (Adrien Roussel). Partners: Inria (MOAIS), IFPEN.

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.

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.

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.

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

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...

EXMO Project-Team (section vide)

<p align="center">**IMAGINE Project-Team**</p>

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 Amiqual4Home project (ANR-11-EQPX-0002).

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 challegnes 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.

MAVERICK 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.

PERCEPTION Project-Team (section vide)

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.