



RESEARCH CENTER
Sophia Antipolis - Méditerranée

FIELD

Activity Report 2014

Section Contracts and Grants with Industry

Edition: 2015-03-24

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ABS Project-Team (section vide)

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).

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 ⁰, 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 .

⁰<http://www.besa.de/>

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.

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.

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.

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.

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

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

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.

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.

FOCUS Project-Team (section vide)

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.

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

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)

INDES Project-Team (section vide)

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.

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.

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.

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.

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.

MODEMIC Project-Team (section vide)

MORPHEME Project-Team (section vide)

NACHOS Project-Team (section vide)

NEUROMATHCOMP Project-Team (section vide)

OPALE Project-Team (section vide)

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](#)).

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.

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.

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

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.

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.

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) 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.