



RESEARCH CENTER
Sophia Antipolis - Méditerranée

FIELD

Activity Report 2013

Section Contracts and Grants with Industry

Edition: 2014-03-19

1. ABS Project-Team (section vide)	4
2. AOSTE Project-Team	5
3. APICS Project-Team	6
4. ASCLEPIOS Project-Team	7
5. ATHENA Project-Team	9
6. AXIS Project-Team (section vide)	10
7. AYIN Team	11
8. BIOCORE Project-Team	12
9. CASTOR Team	13
10. COATI Project-Team	14
11. COFFEE Project-Team	15
12. COPRIN Project-Team	16
13. DEMAR Project-Team	17
14. DIANA Team	18
15. FOCUS Project-Team (section vide)	19
16. GALAAD Project-Team	20
17. GEOMETRICA Project-Team	21
18. GRAPHIK Project-Team	22
19. INDES Project-Team (section vide)	23
20. LAGADIC Project-Team	24
21. LOGNET Team	25
22. MAESTRO Project-Team	26
23. MARELLE Project-Team (section vide)	28
24. MCTAO Project-Team	29
25. MODEMIC Project-Team (section vide)	30
26. MORPHEME Project-Team	31
27. NACHOS Project-Team	32
28. NEUROMATHCOMP Project-Team (section vide)	33
29. OASIS Project-Team (section vide)	34
30. OPALE Project-Team	35
31. REVES Project-Team	36
32. SCIPORT Team (section vide)	37
33. STARS Project-Team	38
34. TITANE Team	39
35. TOSCA Project-Team	40
36. VIRTUAL PLANTS Project-Team (section vide)	41
37. WIMMICS Project-Team	42
38. ZENITH Project-Team	43

ABS Project-Team (section vide)

AOSTE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Kalray MPPA256 experiments

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

Part of this 10-month contract was meant to fund two internships, in our case on:

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

7.1.2. Astrium/CNES PostDoc

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

The post-doctoral position of Raul Gorcitz was funded on this contract.

7.1.3. Kontron CIFRE

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

APICS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contract CNES-Inria-XLIM

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

7.2. Contract CNES-Inria-UPV/EHU

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

ASCLEPIOS Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Inria - Mauna Kea Technologies I-Lab SIWA

6.1.1. Inria - Mauna Kea Technologies I-Lab SIWA

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

GPU, registration, OpenCL

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

For more information, see [here](#).

6.2. CIFRE PhD Fellowships

6.2.1. General Electric

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

6.3. Other contracts

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

6.4. Creation of spin-off company Therapixel

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

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

6.5. National initiatives

6.5.1. Consulting for Industry

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

6.5.2. Collaboration with national hospitals

Asclepios is collaborating with the following 3 IHU (University Hospital Institute) in France : the IHU-Strasbourg (Pr J. Marescaux and L. Soler) on image-guided surgery, the IHU-Bordeaux (Pr M. Haïssaguere and Pr P. Jaïs) on cardiac imaging and modeling and the IHU-Pitié 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. Patent

Participants: Maureen Clerc, Thomas Brochier, Romain Trachel.

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

7.2. CIFRE PhD contract with Neurelec

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

Title: Modeling and characterizing electrical conductivity for the placement of cochlear implants.

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

7.3. PACA PhD contract with Olea Medical

Participants: Marco Pizzolato, Rachid Deriche.

Title: Diffusion & Perfusion MRI : From bench to bedside

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

7.4. dMRI@Olea-Medical

Participants: Aurobrata Ghosh, Théodore Papadopoulo, Rachid Deriche.

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

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

AXIS Project-Team (section vide)

AYIN Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts and Grants with Industry

7.1.1. EADS foundation Paris

Participants: Ikhlef Bechar, Josiane Zerubia [PI].

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

7.1.2. ASTRIUM EADS Toulouse

Participants: Paula Craciun, Josiane Zerubia [PI].

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

7.1.3. CNES Toulouse

Participants: Ihsen Hedhli, Josiane Zerubia [PI].

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

7.1.4. CNES Toulouse

Participants: Aurélie Boisbunon, Josiane Zerubia [PI].

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

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 Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

COATI Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

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

Participants: Jean-Claude Bermond, Sébastien Félix.

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

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

Participants: Michel Syska, Mohamed Amine Bergach.

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

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

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

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

COFFEE Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

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

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

COPRIN Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Thales Alenia Space

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

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

7.2. Airbus France

Participant: Yves Papegay.

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

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

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

DEMAR Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. *IFP Energies Nouvelles*

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

7.1.2. *MXM/CIFRE*

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

DIANA Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

FOCUS Project-Team (section vide)

GALAAD Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. Algebraic-geometric methods for design and manufacturing

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

GEOMETRICA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. *Contrat Cifre with Geometry Factory*

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

7.1.2. *Commercialization of cgal packages through Geometry Factory*

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

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

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

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

Thales (GIS, France) 2D constrained triangulation

GRAPHIK Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. ABES

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

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

7.2. CTFC

Participants: Patrice Buche, Jérôme Fortin, Awa Diattara.

We have initiated a national collaboration with the technical center of 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 will allow us to validate the integration of our theoretical tools into a real-world application and strengthen GraphIK's involvement in agronomy applications. A master degree internship in collaboration with CTFC was done by Awa Diattara (University Gaston Berger of Saint-Louis, Sénégal) in 2012. Awa Diattara came back as engineer to complete her work for a six month period in 2013.

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

7.3. Panzani

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

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

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

INDES Project-Team (section vide)

LAGADIC Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Foundation EADS

Participants: Antoine Petit, Eric Marchand.

no. Inria Rennes 5605, duration: 36 months.

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

7.1.2. Astrium EADS

Participants: Tawsif Gokhool, Patrick Rives.

no. Inria Sophia 7128, duration: 36 months.

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

7.1.3. ECA Robotics

Participants: Romain Drouilly, Patrick Rives.

no. Inria Sophia 7030, duration: 36 months.

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

LOGNET Team

7. Bilateral Contracts and Grants with Industry

7.1. myMed

Participants: Luigi Liquori, The Mymed Team.

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

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

MAESTRO Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

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

6.1.1. ADR “*Semantic Networking*” (January 2008 – April 2013)

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

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

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

6.1.2. ADR “*Self-Organized Networks in Wireless*” (October 2012 –)

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

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

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

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

6.1.3. ADR “*Network Science*” (January 2013 – January 2016)

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

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

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

6.2. Bilateral Grants with Industry

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

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

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

Participants: Pierre Cotelle, Pierre Dersin, Sébastien Simoens.

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

P. Nain is responsible for Inria.

MARELLE Project-Team (section vide)

MCTAO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Thales Alenia Space - Inria

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

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

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

7.2. CNES - Inria - UMB

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

It involves CNES and McTAO both through Inria and through Université de Bourgogne. It concerns averaging techniques in orbit transfers around the earth while taking into 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

5. Bilateral Contracts and Grants with Industry

5.1. Bilateral Contracts with Industry

Participants: Grégoire Malandain, Thomas Benseghir [Asclepios].

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

NACHOS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Seismic risk assessment by a discontinuous Galerkin method

Participants: Nathalie Glinsky, Stéphane Lanteri, Fabien Peyrusse.

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

NEUROMATHCOMP Project-Team (section vide)

OASIS Project-Team (section vide)

OPALE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

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

REVES Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. Autodesk

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

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

6.2. Bilateral Grants with Industry

6.2.1. Autodesk

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

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

6.2.2. Adobe

Participants: George Drettakis, Gaurav Chaurasia.

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

SCIPORT Team (section vide)

STARS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

TITANE Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. *Astrium*

Participants: Sven Oesau, Florent Lafarge, Pierre Alliez.

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

- Starting date: April 2012

- Duration: 3 years

7.1.2. *Geoimage*

Participants: Liuyun Duan, Florent Lafarge, Pierre Alliez.

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

- Starting date: November 2013

- Duration: 3 years

7.1.3. *Technicolor*

Participants: Xavier Rolland-Neviere, Pierre Alliez.

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

- Starting date: October 2012

- Duration: 3 years

...

TOSCA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

7.2. Bilateral Grants with Industry

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

7.3. Promotion of Mathematics in the industry

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

VIRTUAL PLANTS Project-Team (section vide)

WIMMICS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Alcatel Lucent Bell Labs

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

7.2. SAP

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

7.3. SynchroNext

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

ZENITH Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Microsoft (2013-2017)

Participants: Ji Liu, Esther Pacitti, Patrick Valduriez.

This joint project is on advanced data storage and processing for cloud workflows with the Kerdata team in the context of the Joint Inria – Microsoft Research Centre. The project addresses the problem of advanced data storage and processing for supporting scientific workflows in the cloud. The goal is to design and implement a framework for the efficient processing of scientific workflows in clouds. The validation 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 are developing will then be able to extract knowledge from the whole set of distributed data, while avoiding centralization, and guaranteeing data privacy for all peers.