Activity Report 2016

Section Contracts and Grants with Industry

AOSTE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Airbus CIFRE grant   This contract, started on March 2014, provides full support for the PhD thesis of Cristian Maxim. The thesis concerns the statistical timing analysis while different variability factors are taken into account. The proposed methods are built on top of existing statistical approaches while proving appropriate programs for training these methods and thus learning from the history of the execution.

AROMATH Project-Team (section vide)

<div align="center" style="color:red">

DATASHAPE Team

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8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Research contract with GeometryFactory in the context of Mael Rouxel-Labbé's Ph.D. thesis on anisotropic mesh generation [12].

MARELLE Project-Team (section vide)

ACUMES Project-Team (section vide)

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

6. Bilateral Contracts and Grants with Industry

6.1. 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".

6.2. 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.

6.3. 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 5.1.5 . BESA is funding half of the corresponding research grant, the other half is supported by Region PACA (BDO), see Section 1 .

6.4. Flextronics

Flextronics, active in the manufacturing of communication devices all over the world, bought two sets of licenses for Presto-HF and Dedale-HF. Deployment of our tools in their production facilities for wireless communication units is being studied.

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[0]http://www.besa.de/

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

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, Lemma engineer provided to Inria and hosted by Inria under a Inria-Lemma contract.

MCTAO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. CNES - Inria - UB Contract

Contract number: 130777/00. Call Number: R-S13/BS-005-012

"Perturbations and averaging for low thrust" (Poussée faible et moyennation).
Research contract between CNES and McTAO (both the Inria and the Université de Bourgogne parts). It runs for the period 2014-2017. 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. It has co-funded the PhD thesis of Jeremy Rouot [2] (also co-funded by Région PACA) and fully funded the postdoc of Florentina Nicolau [32], [31].

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

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. *Nucletudes*

Participants: Patrick Breuilh [Nuclétudes, Les Ulis, France], Alexis Gobé, Stéphane Lanteri.

The objective of this collaboration with the Nucletudes company that has been initiated this year is to design a high order HDG formulation able to deal with non-conforming hybrid cubic/tetrahedral meshes, for the simulation of time-domain electromagnetic wave propagation problems with applications to radiation hardening. This first part of this study has been concerned with the specification and development of a preprocessing tool for the construction of such hybrid structured/unstructured meshes.
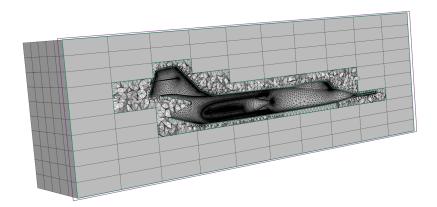

Figure 12. Non-confoming hybrid cubic/tetrahedral mesh around a jet fighter for Radar Cross Section evaluation using a frequency-domain Maxwell solver based on a HDG method.

<div align="center" style="color:red">

TOSCA Project-Team

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7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

- M. Deaconu is involved in a bilateral contract with Venathec. She is supervising, with E. Vincent (EPI MULTISPEECH), the Ph.D. thesis of B. Dumortier on the acoustic control of wind farms noise.

7.2. Bilateral Grants with Industry

- Mireille Bossy is the Coordinator of the PEPS from AMIES granted with the SME Seatopic, on the wind downscaling, using finer local topography, for coastal activities.

- Mireille Bossy is the Coordinator of the TER project from the PGMO (FMJH) granted with the SME METIGATE, on the statistical description of coupled regional temperatures.

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

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral contracts with industry

In this section, we describe the collaboration between ABS and MS Vision (http://msvision.eu/), and company based in the Netherlands. MSVision was created in 2004 and currently involves 20 employees; it is a worldwide leader in delivering tailored hardware solutions to the mass spectrometry community. As detailed below, the collaboration aims at strengthening the offer of the company on the algorithmic and software sides.

This collaboration is funded by the Instituts Carnots (http://www.instituts-carnot.eu/en).

7.1.1. *Context*

Protein complexes underlie most biological functions, so that studying such complexes in native conditions (intact molecular species taken in solution) is of paramount importance in biology and medicine. Unfortunately, the two leading experimental techniques to date, X ray crystallography and cryo electron microscopy, involve aggressive sample reparation (sample crystallization and sample freezing in amorphous ice, respectively) which may damage the structures and/or create artifacts. These experimental constraints legitimate the use of mass spectrometry (MS) to study biomolecules and their complexes under native conditions, using electrospray ionization (ESI), a soft ionization technique developed by John Fenn (Nobel prize in chemistry, 2002). MS actually delivers information on the masses of the molecular species studied, from which further information on the stoichiometry, topology and contacts between subunits can be inferred. Thanks to ESI, MS is expected to play a pivotal role in biology to unravel the structure of macromolecular complexes underlying all major biological processes, in medicine and biotechnology to understand the complex patterns of molecules involved in pathways, and also in biotechnologies for quality checks.

7.1.2. *Specific goals*

A mass spectrometer delivers a mass spectrum, i.e. an histogram representing the relative abundance of the ions (ionized proteins or protein complexes in our case), as a function of their mass-to-charge (m/z) ratio. Deconvoluting a mass spectrum means transforming it into a human readable mass histogram. Due to the nature of the ESI process (i.e. the inclusion of solvent and various other molecules) and the intrinsic variability of the studied biomolecules in native conditions, the interpretation of such spectra is delicate. Methods currently used are of heuristic nature, failing to satisfactorily handle the aforementioned difficulties. The goal of this collaboration is to develop optimal algorithms and the associated software to fill the critical gap of mass spectra deconvolution. The benefits for the analyst will be twofold, namely time savings, and the identification of previously undetected components. Upon making progress on the deconvolution problem, the collaboration will be expanded on the geometric and topological modeling of large macro-molecular assemblies, a topic to which ABS recently made significant contributions [2], [3].

ASCLEPIOS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. CIFRE PhD Fellowships

7.1.1.1. Neurelec/Oticon Medical

Participants: Thomas Demarcy [correspondent], Hervé Delingette, Nicholas Ayache, Dan Gnansia [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.

7.1.2. Inria - Mauna Kea Technologies I-Lab SIWA

Participants: Nicholas Ayache [correspondent], Xavier Pennec, Marzieh Kohandani Tafreshi, Rémi Cuingnet.

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 users make a diagnosis. 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 since it is a critical method for the smart atlas.

For more information, see this link[0]. The I-lab SIWA ended in March 2016.

7.1.3. Microsoft Research

Microsoft Research is funding through the Inria-Microsoft joint lab the projects "4D Cardiac MR Images"[0] and "Medilearn"[0] which aim 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, Pawel Mlynarski as well as the post doctoral stay of Hervé Lombaert.

7.1.4. Spin-off company Therapixel

Therapixel[0] 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, which sterility constraints made impractical in the past. In 2015, Therapixel obtained the CE marking of its product on touchless visualization of medical images.

7.1.5. Siemens HealthCare

Siemens Healthcare, Medical Imaging Technologies, Princeton, NJ (U.S.A). is funding the Phd work of Julian Krebs which aims at developping robust medical image registration methods

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[0]https://lisa.sophia.inria.fr/siwa-loasis-numerique-dinria-et-de-mauna-kea-706.html
[0]http://www.msr-inria.fr/projects/4d-cardiac-mr-images
[0]http://www.msr-inria.fr/projects/medilearn
[0]http://www.therapixel.com/

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

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

- The Olea Medical company from La Ciotat (FR) funds 50% of the PhD of Marco Pizzolato, supervised by Rachid Deriche, which is funded by the PACA Region for the remaining 50%.
- The dMRI Library has been transfered to the Olea Medical company.
- The BESA company (Brain Electrical Source Analysis) from Germany funds 50% of the PhD of Christos Papageorgakis, co-supervised by Maureen Clerc (Athena) and Juliette Leblond (Apics), which is funded by the PACA Region for the remaining 50%.
- The Neurelec company (Cochlear Implants) has obtained a CIFRE PhD funding for Kai Dang, supervised by Maureen Clerc.

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

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

BioEnTech: the collaboration 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.

Inalve: with the Inalve start-up we develop a breakthrough process that we patented, in which microalgae grow within a moving biofilm. The objective of the collaboration is to optimize the process by enhancing productivity, while reducing environmental footprint.

BIOVISION Team (section vide)

CAMIN Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

FUI MMCD (Multifunctions Modular Cockpit Display) [2014-2017] Labels : Pegase, ASTech
The MMCD project (Multi Functions Modular Cockpit Display) aims at designing a mechatronic architecture that is modular, certifiable and evolutive in terms of embedded GPU. This project will contribue to Avionics 2020 by developing a mock-up of new cockpit display system, allowing easy to manage GPU evolution.
Our contribution concerns formal design and prototyping of embedded supervisory functions, using the HILECOP methodology and tool.

8.2. Bilateral Grants with Industry

CIFRE phd financial support with Axonic (PhD grant), Wafa Tigra, 2013-2016, restoration of grasping using FES and selective stimulation

CASTOR Project-Team (section vide)

COFFEE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants 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.

COFFEE has also a collaboration with BRGM, funded through the program "Carnot Institutes", devoted to the setting of a parallel computing platform for the simulation of geothermal reservoirs. We aim at contributing to the design of a new generation of parallel tools of simulations, addressing the stiffness issues of actual reservoirs, a large variety of mesh geometries, able to handle faulted media.

A large part of these works is based on the development of the software COMPASS.

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

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Free surface hydraulics

The finite volume-based, SW2D computational code (see Software section) is used by Cereg Ingénierie and Enveo (Montpellier Lavérune location) 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.

8.1.2. Hydrodynamics of coastal lagoons with porosity models

A two-dimensional shallow water with depth-variable porosity has been developed. The depth-variable porosity allows the subgrid-scale variations of the topography and hydraulic connectivity to be accounted for. The governing equations are written in conservation form and solved using a finite volume scheme. This allows the CPU time of the computational code to be divided by 2 to 3 orders of magnitude. The model is currently being tested against in situ measurements in the Vaccarès system in collaboration with Tour du Valat.

8.2. Bilateral Grants with Industry

Antoine ROUSSEAU collaborates with ARTELIA in the framework of M-P Daou's PhD thesis (CIFRE).

MATHNEURO Team (section vide)

MORPHEME Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

General Electric Healthcare: a 36 months (from feb. 2016 to jan. 2019) companion contract for the Cifre thesis of E. Poulain.

Bayer, Lyon. In December, we signed a collaboration contract with Bayer, Lyon, to fund a Master 2 internship with some overhead on the topic of automatic cell classification. The intern will start working on the subject in January 2017.

VIRTUAL PLANTS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Guillaume Garin has been funded by itk (http://www.itk.fr/en/). With itk, a generic model of plant pathosystem was developed in the OpenAlea platform and illustrated on Vine and Wheat.

COATI Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

8.1.1. Allocation Carnot Inria / Instant System

Participants: David Coudert, Idriss Hassine.

The Instant System startup company develop a platform in the area of Intelligent transportation systems (ITS). The partnership with COATI aims at designing algorithms for itinerary planning in multimodal transportation networks. The main objective is to combine public transport system and dynamic car-pooling.

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

7. Bilateral Contracts and Grants with Industry

7.1. Enabling network function composition with Click middleboxes

In the context of the common Inria - Nokia Bell-Labs laboratory on Communication networks of the future, we participate to the Content Centric Networking ADR (Action de Recherche). In the context of this ADR, a post-doctoral researcher, Anandatirtha Nandugudi Sathyaraja, is working on enabling network function composition with Click middleboxes. In fact, the Click modular router has significant advantages for middlebox development, including modularity, extensibility, and reprogrammability. Despite these features, Click still has no native TCP support and only uses nonblocking I/O, preventing its applicability to middleboxes that require access to application data and blocking I/O. In this paper, we attempt to bridge this gap by introducing Click middleboxes (CliMB). CliMB provides a full-fledged modular TCP layer supporting TCP options, congestion control, both blocking and nonblocking I/O, as well as socket and zero-copy APIs to applications. As a result, any TCP network function may now be realized in Click using a modular L2-L7 design. As proof of concept, we develop a zero-copy SOCKS proxy using CliMB that shows up to 4 times gains compared to an equivalent implementation using the Linux in-kernel network stack.

FOCUS Project-Team (section vide)

INDES Project-Team (section vide)

<div align="center">**MAESTRO Project-Team**</div>

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

MAESTRO members are involved in the

- Inria Nokia 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 §8.1.1 and §8.1.2).

- Inria ALSTOM joint laboratory: the joint laboratory consists of four projects. MAESTRO members participate in project P11 (see §8.1.3).

8.1.1. ADR "Self-Organized Networks in Wireless" (July 2008 – September 2016)
Participant: Eitan Altman.

- Contractor: Nokia Bell Labs (http://www.bell-labs.com)
- Collaborator: Laurent Roullet (coordinator).

Coordinator for Inria: Eric Fleury (team DANTE).

8.1.2. ADR "Network Science" (June 2013 – March 2017)
Participants: Konstantin Avrachenkov [coordinator], Guillaume Huard, Jithin Kazhuthuveettil Sreedharan, Giovanni Neglia.

- Contractor: Nokia Bell Labs (http://www.bell-labs.com)
- 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.

8.1.3. Project P11 "Data Communication Network Performance" (December 2013 – May 2016)
Participants: Sara Alouf [coordinator], Konstantin Avrachenkov, Philippe Nain, Giovanni Neglia, Alina Tuholukova.

- Contractor: ALSTOM Transport (http://www.alstom.com/transport/)
- Collaborators: Pierre Cotelle, Pascal Derouet (coordinator from November 2015), Pierre Dersin, Sébastien Simoens (coordinator until October 2015).

The objective of this study is to build a simulation platform (see §6.2) 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.

8.1.4. *"Hybrid GPS-free Localization Algorithms" (May 2016 – October 2016)*

Participants: Giovanni Neglia [coordinator], Dimitra Politaki.

- Contractor: LUCIE LABS (http://www.lucielabs.com/)
- Collaborators: François Mazard.

G. Neglia and D. Tsigkari, together with F. Mazard (LUCIE LABS) did a literature survey of localization algorithms that could be deployed in Lucie Labs entertainment wristbands. They proposed a localization algorithm that combines information from Bluetooth and WiFi connectivity in a centralized way. This activity was partially funded by AMIES (Agence pour les Mathématiques en Interaction avec l'Entreprise et la Société).

8.2. Bilateral Grants with Industry

8.2.1. *Huawei CIFRE on the topic "Scalable Online Algorithms for SDN controllers" (June 2016 – May 2019)*

Participants: Zaid Allybokus, Konstantin Avrachenkov.

- Contractor: Huawei   Technologies   (http://www.huawei.com/en/about-huawei/research-development)
- Collaborators: Jérémie Leguay et Lorenzo Maggi

Software-Defined Networking (SDN) technologies have radically transformed network architectures. They provide programmable data planes that can be configured from a remote controller platform.

The objective of this CIFRE thesis is to provide fundamental answers on how powerful SDN controller platforms could solve large online flow problems to optimize networks in real-time and in a distributed or semi-distributed fashion. We plan to use methods from both optimization and dynamic programming.

AYIN Team (section vide)

GRAPHDECO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Optis

Participants: Valentin Deschaintre, Adrien Bousseau, George Drettakis.

Valentin Deschaintre is starting a CIFRE PhD in collaboration with Optis, a company specialized in material acquisition and rendering.

7.2. Bilateral Grants with Industry

7.2.1. Technicolor

Participants: George Drettakis, Adrien Bousseau.

We have initiated a collaboration with Technicolor on the use of deep learning for computational photography and video tasks. This will involve the use of our synthetic ground truth data generation platform (see Sec. 5.4) to tasks such as color grading and white balance. This is a collaboration with P. Pérez and E. Reinhard of Technicolor.

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

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. UMR IATE / UMR STLO / Régilait

Participants: Patrice Buche, Jérôme Fortin, Alain Gutierrez.

In the framework of a contract between INRA IATE and STLO (Rennes) research units and Régilait, two master students have been recruited in 2016. Marine Damblon, food engineer from Polytech Montpellier, has created a knowledge base which represents the causal links between a food descriptor (mouillabilité des poudres de lait) and actions which can be undertaken by operators to control food quality on the line. Justine Flore Tchouanguem participated to the development of the new CoGui-Capex version presented in section 5.4 . CoGui-Capex prototype has been successfully evaluated by Régilait and is considered to be used in production conditions in its milk powder factory in Macon. Marine Damblon has been recruited by Régilait for that. This collaboration will be extended in 2017 and a new master student should be recruited.

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

8. Bilateral Contracts and Grants with Industry

8.1. Airbus

8.1.1. *Airbus*

Participant: Yves Papegay.

Research activities on MOSELA environment, section 7.3.2 , have been covered by a contract with Airbus company.

8.1.2. *GénérationRobot*

Participant: Jean-Pierre Merlet.

- we have got a grant from the company GénérationRobot to develop a pedagogical cable-driven parallel robot as a direct consequence from our research work, see section 7.1.1 .

8.1.3. *Ellcie-Healthy*

Participants: Alain Coulbois, Jean-Pierre Merlet.

- we have got a grant from the company Ellcie-Healthy to evaluate connect objects that are developed by this company.

LAGADIC Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

8.1.1. *Technicolor*
Participants: Salma Jiddi, Eric Marchand.

no Univ. Rennes 1 15CC310-02D, duration: 36 months.

This project funded by Technicolor started in October 2015. It supports Salma Jiddi's Ph.D. about augmented reality (see Section 7.1.7).

8.1.2. *Realyz*
Participant: Eric Marchand.

no Inria Rennes 10822, duration: 36 months.

This project funded by Realiz started in October 2015. It is realized in cooperation with Anatole Lecuyer, Hybrid group at Irisa and Inria Rennes-Bretagne Atlantique to support Guillaume Cortes Ph.D. about motion capture.

8.1.3. *Pôle Saint Hélier*
Participants: Louise Devigne, Marie Babel.

no. Insa Rennes 2015/0890, duration: 36 months.

This project started in November 2015. It addresses the following two issues. First, the idea is to design a low-cost indoor / outdoor efficient obstacle avoidance system that respects the user intention, and does not alter user perception. This involves embedding innovative sensors to tackle the outdoor wheelchair navigation problem. The second objective is to take advantage of the proposed assistive tool to enhance the user Quality of Experience by means of biofeedback as well as the understanding of the evolution of the pathology.

8.1.4. *Axyn*
Participants: Dayana Hassan, Paolo Salaris, Patrick Rives.

no Inria Sophia 10874-1, duration: 36 months.

The objective of this project that started in November 2016 is to explore new methodologies for the interaction between humans and robots, autonomous navigation and mapping and to transfer the results obtained on the robotic platform developed by AXYN for assisting disabled/elderly people at home or in hospital structures. Cost limits, good accessibility to aged people, robustness and safety related to the applications are at the heart of the project. This contract (ANRT-CIFRE) support Dayana Hassan's Ph.D.

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

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 older adults.

- **LinkCareServices**: this project with Link Care Services runs from 2010 upto 2015. 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.

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

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. 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 digital elevation models (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: 4 years

8.1.2. CSTB 1

Participants: Sven Oesau, Florent Lafarge.

The goal of this collaboration was to consolidate and integrate research codes developed in Titane on urban semantization and reconstruction into the CSTB reconstruction platform.

- Starting date: September 2015 - Duration: 6 months

8.1.3. CSTB 2

Participants: Hao Fang, Florent Lafarge.

The goal of this recent collaboration is to develop methods for analyzing and exploring scale-spaces into urban 3D data.

- Starting date: March 2016 - Duration: 3 years

8.1.4. Luxcarta

Participants: Jean-Philippe Bauchet, Florent Lafarge.

The goal of this recent collaboration is to design automatics approaches for producing LOD2 city models from the last generation of satellites.

- Starting date: October 2016 - Duration: 3 years

8.2. Bilateral Grants with Industry

8.2.1. CNES Toulouse

Participants: Emmanuel Maggiori, Yuliya Tarabalka [PI].

Hierarchical approaches for object-oriented classification of multi-source images. Contract 150490/00.

- Starting date: November 2015
- Duration: 2 years

<div align="center">**WIMMICS Project-Team**</div>

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

We have CIFRE PhD funding with Synchronext for the design of a conversational agent assistant endowed with natural language and intuition.

We have CIFRE PhD funding with Educlever on the topic of semantic analysis of activities in a learning environment.

8.2. Bilateral Grants with Industry

8.2.1. *Semantic EDUCLOUD Carnot Project*

Participants: Oscar Rodríguez Rocha, Catherine Faron-Zucker.

Partner : GAYAtech. This project was just accepted this year on the topic of *semantic Web for e-learning*. This is a joint project with Gayatech on the recommendation of pedagogical resources adapted to user profile and context in the EDUCLOUD 06 Serious Game. To get help in his quests and various quiz testing his knowledge, the gamer can use external digital resources (books, video, TV, Web) and an in-game social network to work with his teacher and comrades. In this context, and to meet the needs of GAYATECH developing edutainment solutions, the Semantic EDUCLOUD project aims to improve the recommendation of educational resources to learners in EDUCLOUD 06, by using semantic Web and social Web models and techniques.

8.2.2. *Vigiglobe Carnot Project*

Participants: Elena Cabrio, Serena Villata.

Partner : Vigiglobe.

This project was just accepted this year on the topic of *Natural Language Argumentation on Twitter: Retrieval of Argumentative Structures and Reasoning*. this is a joint project with Vigiglobe on the natural language processing of argumentation on Twitter to retrieve argumentative structures and reason on them. The goal of the project is to : (1) Automate the selection and annotation of tweets, i.e., retrieval of those tweets that can be considered as arguments (2) Automate the assignment of labels to the type of relation holding between arguments - positive relation or negative relation. (3) Create an argumentation graph illustrating the relations between the arguments about a certain subject, and the further application of argumentation semantics to compute the set of "winning" arguments This graph-based visualization provides a summary of the ongoing discussion on Twitter.

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

8. Bilateral Contracts and Grants with Industry

8.1. Microsoft ZcloudFlow (2013-2017)

Participants: Jalexis Joly, Ji Liu, Esther Pacitti, Patrick Valduriez.

ZcloudFlow is a project in collaboration with the Kerdata team in the context of the Joint Inria–Microsoft Research Centre. It 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 is performed using synthetic benchmarks and real-life applications from bioinformatics on the Microsoft Azure cloud with multiple sites.

8.2. Triton I-lab (2014-2016)

Participants: Benjamin Billet, Didier Parigot.

Triton is a common Inria lab (i-lab) between Zenith and Beepeers (http://beepeers.com/) to work on a scalable platform for developing social networks in mobile/Web environments. The main objective of this project is to design and implement a new architecture for Beepeers applications to scale up to high numbers of participants. The new platform relyes on our SON middleware and NoSQL graph databases.