



RESEARCH CENTER

FIELD

Digital Health, Biology and Earth

Activity Report 2013

Section Contracts and Grants with Industry

Edition: 2014-03-20

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ABS Project-Team (section vide)

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BIGS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Start-up project by T. Bastogne:

- Industrial partner: Cybernano (Contract Research Organization in NanoMedicine).
- Status: SAS created in July 2013.
- Comments: Cybernano has received the "emergence" award in 2012 from the French Research ministry for the creation of start-up based on innovative technology. Cybernano proposes innovating services to reduce the cost and control the risk during the preclinical development of nanoparticles in oncology applications. The engineering approach used by this spin-off is strongly based on the use of suited mathematical models. Concerning the BIGS program for the next four years, Cybernano is particularly interested by two items: (i) Development of a Matlab toolbox for cost-effectiveness analysis in clinical studies. (ii) Development of algorithms for treatment planning systems associated with nano-therapies.

BONSAI Project-Team (section vide)

DYLISS Project-Team (section vide)

GENSCALE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. I-Lab Koriscale

In June 2013, GenScale and the Korilog Company created an Inria common structure research (I-LAB) called KoriScale. This is the outcome of a solid relationship, which has enable the transfer of the PLAST software (bank to bank genomic sequence comparison) from GenScale to Korilog. The resulting commercial product (Klast) is now 5 to 10 times faster than the reference software (Blast). The main research axe of the I-LAB focuses on comparing huge genomic and metagenomic datasets.

7.2. Sequence Comparison, Korilog

Intensive bank-to-bank comparison with Korilog : this collaborative project between the Korilog company and the GenScale team aims to investigate new research directions in the bank-to-bank sequence comparison problem. Two research axes are followed : constrained exploration of the search space and adaptation of the ORIS algorithm, developed by D. Lavenier for fast DNA comparison, to the protein sequences. It is funded for 3 months (Nov. 2012 - Feb. 2013).

7.3. Sequence Comparison, Kalray

Parallelization of PLAST on many cores : This collaboration aims to implement he PLAST software on the MPPA chip (256 cores) developed by the Kalray company. PLAST is a BLAST-like parallel implementation of the bank to bank genomic sequence comparison problem. More generally, the purpose, here, is to investigate the performances of the MPPA architecture on scientific life science software. This is a bilateral contract of 4 months, from April to August 2013.

7.4. Peapol

The Peapol project is funded by Sofiproteol company whose mission is to develop the French vegetable oil and protein industry, open up new markets, and ensure an equal distribution of value among its members. The Peapol project counts two collaborators, Biogemma, and INRA, the latter working in collaboration with the Genscale team, in charge of algorithmic research in the context of the project. This collaboration enabled to hire in the Genscale team Raluca Uricaru for 18 months on an INRA post doctoral position, followed by Susete Alves-Carvalho (engineer).

7.5. Rapsodyn

RAPSODYN is a long term project funded by the IA French program (Investissement d'Avenir) and several field seed companies, such as Biogemma, Limagrain and Euralis. The objective is the optimisation of the rapeseed oil content and yield under low nitrogen input. GenScale is involved in the bioinformatics workpackage, in collaboration with Biogemma's bioinformatics team, to elaborate advanced tools dedicated to polymorphism.

IBIS Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Genostar

Participant: François Rechenmann.

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

6.2. BGene

Participant: Johannes Geiselman.

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

MAGNOME Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

MAGNOME and the company BioLaffort are contracted to develop analyses and tools for rationalizing wine starter strain selection using genomics.

7.2. Bilateral Grants with Industry

The “SAGESS” project, below, section [8.1.1](#) , has been partially funded by a grant to BioLaffort from the Region.

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.

SERPICO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Innopsys: Methods and algorithms for tissue microarrays image analysis

In collaboration with Magellium company and Institut Gustave Roussy, Innopsys plans to develop new image analysis software to be included in the INGRID platform developed by Megellium company. New statistical methods and algorithms will be investigated by SERPICO for:

- segmentation and detection of deformable cell contours and cell nuclei in 2D fluorescence tissue microarray images;
- deconvolution and superresolution of fluorescence microarray imaging.

The three-year contract supports the PhD thesis of Nam-Hoai Nguyen (2013-2016).

VIRTUAL PLANTS Project-Team (section vide)

CORTEX Team (section vide)

ARAMIS Team

7. Bilateral Contracts and Grants with Industry

7.1. Patents

Participants: Thomas Similowski [Inventor], Mathieux Raux [Inventor], Pierre Pouget [Inventor], Jacques Martinerie [Inventor], Mario Chavez [Inventor].

Patent title: Procédé de caractérisation de l'état physiologique d'un patient à partir de l'analyse de son activité électrique cérébrale, et dispositif de surveillance faisant application

Publication date: 07.11.2013

Publication number: WO 2013/164462 A1

Abstract: The invention relates to a method for detecting a physiological state of a patient deviating from a reference physiological state, in which, after having determined, in Q frequency band, R reference matrices which correspond to the reference physiological state, the following steps are repeated in a loop: carrying out measurements, in M time segments, of an electroencephalographic signal; filtering and centring the measurements in Q frequency bands to obtain and determine $M \times Q$ scaled matrices of spatial covariance; for each time segment m , calculating a deviation from the reference physiological state, and comparing each of the deviations from the reference physiological state to a predefined threshold. The invention also relates to a monitoring device.

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.

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.

GALEN Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- **General Electric HealthCare:**
 - Compressed Sensing Digital Subtraction Rotational Angiography [PhD thesis H. Langet]
 - Guide-wire Segmentation and Tracking of in interventional Imaging [PhD thesis N. Honnorat]
- **Intrasene:** Modeling, segmentation and registration of low gliomas brain tumors [PhD thesis S. Parisot]
- **Siemens:** Graph-based Knowledge-based Segmentation of the Human Skeletal Muscle in MR Imaging [PhD thesis P-Y. Baudin]

MNEMOSYNE Team (section vide)

NEUROMATHCOMP Project-Team (section vide)

NEUROSYS Team (section vide)

PARIETAL Project-Team (section vide)

Popix Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

POPIX has a contract with Astrazeneca (November 2011 - November 2013)

POPIX has a contract with Lixoft (June 2011 - June 2014)

SHACRA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

InSimo is a startup we created in January 2013, after two years of thinking, maturation and incubation. Its founding members are all former or actual team members of SHACRA: Jeremie Allard, Juan Pablo de la Plata Alcalde and Pierre Jean Bensoussan have joined the operation team, while Stephane Cotin and Christian Duriez serve as scientific advisors. The business model of the company is based on the SOFA platform and its community to transfer state-of-the-art simulation technologies into commercially-supported software components that medical simulator vendors can integrate into their products. The goal is to foster the creation of a new generation of medical simulators, highly realistic, faster to develop, allowing a broader commercial offer and novel uses. InSimo participated to the 2012 OSEO / MESR national innovative technology company creation competition (Emergence category) and was selected as the best project in the Alsace region as well as one of the three projects highlighted at the national level. InSimo also won the HelpMeSee contract (in partnership with Moog and SenseGraphics) and entered in February 2013 into a 3-year development phase to build a first batch of 100 MSICS simulators.

7.2. Bilateral Grants with Industry

We have started a collaboration with INSERM - UMR-S 867 (minimal invasive and robotized otological surgery) Faculté de Médecine Paris Diderot Paris 7 and with the company Collin SA (Bagneux, France) which is developing some activities in the domain of the head and neck (surgical robot such as RobOtol, middle ear implants, surgical instruments, surgical navigation, ...). The objective of this project is to obtain a simulation tool applied to the ear surgery for both training and planning of conventional and robotized middle ear surgery. In addition, the aim of this work is to provide a tool able to explore, develop and assess new robotized procedures using a tele-operated device called RobOtol. Guillaume Kazmitcheff is doing his PhD in the context of this collaboration: he is paid by a CIFRE contract with Collin, he is mainly working with the INSERM team but the design of the simulation is done in collaboration with our group and he is enrolled in the university of Lille 1.

VISAGES Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Siemens

duration: 5 years from 2011/10/26

In the context of the Neurinfo imaging platform, a partnership between Siemens SAS - Healthcare and University of Rennes 1 was signed in October 2011 for 5 years. This contract defines the terms of the collaboration between Siemens and the Neurinfo platform. The Neurinfo platform has received work in progress (WIP) sequences from Siemens in the form of object code for evaluation in the context of clinical research. The Neurinfo platform has also received source code of selected MRI sequences. This a major advance in the collaboration since it will enable the development of MRI sequences on site.

ANGE Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

The team is engaged in two industrial contracts:

- **La compagnie du vent (subsidiary of GDF-Suez)** The team is intended to provide simulations of hydrodynamics in salt marshes This contract is shared with the BIOCORE Inria project-team and comes to 20.000 euros.
- **SAUR** Discussions have been engaged in 2013 and might lead to a research contract in 2014. This project would rely on the optimization of hydrodynamics in a lagoon in order to depollute it.

7.2. Bilateral Grants with Industry

The PhD thesis of P. Ung is financed by CNRS, by AMIES (French agency for mathematics in interaction with companies and the society) and by GeoHyd (now a part of ANTEA-group) whose mission is the management of integrated natural resources. The PhD comprises simulations of concrete cases by means of the EDF software Telemac.

BANG Project-Team (section vide)

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

CLIME Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Clime is partner with INERIS (National Institute for Environmental and Industrial Risks <http://www.ineris.com/en>) in a joint cooperation devoted to air quality forecast. This includes research topics in uncertainty estimation, data assimilation and ensemble modeling.

Clime also provides support to INERIS in order to operate the Polyphemus system for ensemble forecasting, uncertainty estimations and operational data assimilation at continental scale.

- Clime is partner with IRSN <http://www.irsn.fr/>, the French national institute for radioprotection and nuclear safety, for inverse modeling of emission sources and uncertainty estimation of dispersion simulations. The collaboration aims at better estimating emission sources, at improving operational forecasts for crisis situations and at estimating the reliability of forecasts. The work is derived at large scale (continental scale) and small scale (a few kilometers around a nuclear power plant).
- Clime takes part to a joint Ilab with the group SETH (Numtech <http://www.numtech.fr/>). The objective is to (1) transfer Clime work in data assimilation, ensemble forecasting and uncertainty estimation, with application to urban air quality, (2) identify the specific problems encountered at urban scale in order to determine new research directions.

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

FLUMINANCE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contrat CERSAT/IFREMER

This contract aims at studying image based data assimilation strategies for oceanic models incorporating random uncertainty terms. The goal targeted will consist in deriving appropriate stochastic version of oceanic model and on top of them to devise estimation procedures from noisy data to calibrate the associated subgrid models. This contract covers half of the funding of Valentin Resseguier PhD thesis.

MAGIQUE-3D Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts with TOTAL

- Schémas en temps d'ordre élevé pour la simulation d'ondes élastiques en milieux fortement hétérogènes par des méthodes DG.
Period: 2010 November - 2013 October, Management: Inria Bordeaux Sud-Ouest, Amount: 150000 euros.
- Propagateurs optimisés pour les ondes élastiques en milieux anisotropes
Period: 2011 November - 2014 October, Management: Inria Bordeaux Sud-Ouest, Amount: 160000 euros.
- RTM en milieux hétérogènes par équations d'ondes élastiques
Period: 2011 November - 2014 October, Management: Inria Bordeaux Sud-Ouest, Amount: 160000 euros.
- Construction de milieux équivalents en vue de la simulation d'ondes élastiques harmoniques en milieux fortement hétérogènes par des méthodes DG
Period: 2012 October - 2015 October, Management: Inria Bordeaux Sud-Ouest, Amount: 165000 euros
- Simulation de la propagation d'ondes élastiques et visco-élastiques en régime harmonique par des méthodes Galerkin discontinues d'ordre élevé en maillage non structuré adaptées au calcul haute-performance.
Period: 2012 October - 2015 October, Management: Inria Bordeaux Sud-Ouest, Amount: 165000 euros

MOISE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts with Industry

- A 3-year contract with EDF: project MeCSiCo (coupling methods for the simulation of river flows): see [4.4](#)
- A 3-year contract with ARTELIA Group: funding for the PhD thesis of M.P. Daou (CIFRE): see [4.4](#)
- A 2-year contract with ADEME and MAIA EOLIS on the thematic "Stochastic Downscaling Method": see [5.4](#).
- A 4-year contract named ReDICE (Re Deep Inside Computer Experiments) with EDF, CEA, IRSN, RENAULT, IFP on the thematic computer experiments
- A 3-year contract with CEA Cadarache related to Simon Nanty's PhD.
- A 1-year contract with IFREMER on the thematic "Online degradation using the AGRIF software": see [5.1](#)

POMDAPI Project-Team

5. Bilateral Contracts and Grants with Industry

5.1. Bilateral Contracts with Industry

RTE (*Réseau de Transport de l'Électricité*) financially supports the supervision of the PhD thesis of C. Jozs, through a convention that is part of the Cifre, which also partly finances the thesis. J. Ch. Gilbert is the thesis advisor.

Andra (*Agence Nationale pour la gestion des Déchets Radioactifs*) has sponsored the PhD of T. T. P. Hoang, (supervised by J. E. Roberts, C. Japhet and M. Kern) on space–time domain decomposition methods for modeling transport in porous media. This work was part of the Andra–Inria research agreement. The thesis was defended in December 2013 [1].

This work will be continued in the PhD of S. Ali Hassan (supervised by M. Vohralík), to integrate a posteriori error estimation, and adaptive stopping criteria for the iterative methods.

IFPEN (*Institut Français du Pétrole Énergies Nouvelles*) supports a collaboration on numerical methods for the flow simulation in porous media with fractures for modeling sedimentary basins or oil reservoirs. This collaboration concerns J. E. Roberts and J. Jaffré on the Inria side and I. Faille and A. Fumagalli on the IFPEN side.

5.2. Bilateral Grants with Industry

M. Vohralík, together with Vivette Girault (Université de Paris 6), have led the ERT (*Équipe de Recherche Technologique*) project between the Laboratoire Jacques-Louis Lions (LJLL) and IFPEN on “enhanced oil recovery and geological sequestration of CO₂: mesh adaptivity, a posteriori error control, and other advanced techniques”. Project with an industrial partner designed to *overcome a technological issue*.

SAGE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. ANDRA: Numerical methods for reactive transport

Participants: Édouard Canot, Jocelyne Erhel, Souhila Sabit.

Title: Numerical methods for reactive transport.

Time: October 2010-October 2013

Partner: ANDRA Coordination: J. Erhel, with G. Pépin (ANDRA)

Abstract: It is quite challenging to develop a numerical model for deep storage of nuclear waste. The time interval is very large (several thousands years), models are coupled and simulations must be accurate enough to be used for risk assessment. In most cases, chemistry must be included in models of deep geological storage. We have developed an efficient global method coupling transport and chemistry by a Newton-type algorithm. See sections [6.3.4](#) , [4.2](#) , [8.2.7](#) , [5.1.6](#) .

STEPP Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

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

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.

CARMEN Team

7. Bilateral Contracts and Grants with Industry

7.1. Contract Medic Activ between Inria and Interaction Healthcare (Groupe Interaction)

The contract between Interaction Healthcare and Inria was signed on April, 13th, 2013.

Aiming to develop a numerical platform for simulation in medicine called « Medic Activ », the society Interaction Healthcare requested the help of the team Carmen, within a call for project entitled « serious games » from the Région Aquitaine.

The team Carmen will provide its expertise in numerical simulation of cardiac electrophysiology and the ECG (ElectroCardioGram), based on realistic human datasets. The society Interaction Healthcare is specialized in the design and creation of digital services and e-health. The complementarity between both partners is mandatory for the project to start on a coherent scientific basis.

The human resources engaged on the Inria side includes a engineer devoted to the transfert side of the project, while a postdoc will be recruited to work on the research of the project (additional funding from *Agence AMIES*, see below).

DRACULA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

M3DISIM Team (section vide)

MASAIE Project-Team (section vide)

MODEMIC Project-Team (section vide)

NUMED Project-Team

5. Bilateral Contracts and Grants with Industry

5.1. Bilateral Contracts with Industry

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

REO Project-Team (section vide)

SISYPHE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. CGAO_v2 contract: glyceimic control system

Participants: Alexandre Guerrini, Michel Sorine.

Our work on glycaemic control done in the framework of the CIFRE contract of A. Guerrini [31] with LK2 (Tours, France), has led to develop an improved controller, CGAO_v2 (see Sections 4.3 and 5.3). This year, our rights on CGAO_v2 have been sold to LK2 which has packaged it with a user interface in a system used by Fresenius-Kabi in their control software *master GC*.

7.2. SciWorks Technologies contract: development of K-Assessor

Participants: Habib Jreige, Michel Sorine.

The development and a first application of K-Assessor (see Section 5.6) has been done with SciWorks Technologies: risk analysis for *master GC*, a software of Fresenius-Kabi dedicated to glyceimic control assistance based on the control algorithm CGAO_v2 (see Section 5.3).