Activity Report 2013

Section Contracts and Grants with Industry

ALGORILLE Project-Team (section vide)

ALICE Project-Team (section vide)

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

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.

CALVI Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

CLAC is a joint project with a Strasbourg small company, AxesSim, which develops software for electromagnetic simulations. Thomas Strub, who is employed in AxesSim with a CIFRE position, is doing his PhD on the design and development of CLAC applied to electromagnetic problems.

CAMUS Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

A contract with the French company Kalray (http://www.kalray.eu) was established early 2013. It provided to the team the Kalray 256-core MPPA platform and necessary funding to recruit a student for a 6-months internship: Dhruva Tirumala Bukkapatnam. A deep evaluation of the platform regarding performance and programming strategies has been accomplished. Moreover, an extension of the source-to-source compiler Pluto (http://pluto-compiler.sourceforge.net), allowing to automatically generate code adapted for the MPPA has been mostly implemented.

CARAMEL Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Training and Consulting with HTCS

Participants: Pierrick Gaudry, Emmanuel Thomé [contact].

The training and consulting activities begun in 2012 with the HTCS company have been pursued, and the existing contract has been renewed in identical form for 2013 and 2014.

7.2. Study of the Kalray MPPA-256 Processor for Applications in Cryptology

Participants: Jérémie Detrey, Pierrick Gaudry [contact].

A 5-month contract has been signed between CARAMEL (through Inria) and Kalray, a French company which has recently designed and manufactured the MPPA-256 processor, a 256-core VLIW architecture targeted at embedded applications. The objective of this contract was to study the performance of this processor in a cryptographic context. Several key arithmetic primitives, such as multi-precision modular arithmetic or polynomial multiplication in binary and ternary fields, were implemented and optimized to take advantage of the specific micro-architecture and instruction set of the VLIW cores of the MPPA-256. The results are encouraging and prompt us to explore further the possible benefits of this processor for cryptanalytic applications.

7.3. Study of the electronic voting system of Voxaly

Participants: Pierrick Gaudry, Stéphane Glondu [contact].

A 4-month contract has been signed between CARAMEL, CASSIS and Voxaly, a French company who is proposing solutions for the organization of on-line elections. During several meetings, we discussed their current solution and proposed improvements to gradually add security features that get close to the academic standards.

CARTE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

We are currently working with the consortium "malware.lu".

CASSIS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Research Result Transfer

The BZ-Testing-Tools technology has been transfered to LEIRIOS Technologies, at the end of 2004. LEIRIOS changed its name into 2007 and is now called Smartesting. The partnership between the Cassis project and the R&D department of Smartesting, located at the TEMIS Scientific and Industrial area at Besançon, will be continued through (national and international) projects or with a new transfer protocol. F. Bouquet is scientific consultant of Smartesting.

7.2. Study of the electronic voting system of Voxaly

Participants: Stéphane Glondu, Véronique Cortier.

A 4-month contract has been signed between Caramel, Cassis and Voxaly, a French company who is proposing solutions for the organization of on-line elections. During several meetings, we discussed their current solution and proposed improvements to gradually add security features that get close to the academic standards.

CORIDA Project-Team (section vide)

CORTEX Team (section vide)

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

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry: Inria-EDF Strategic action MS4SG

Participants: Laurent Ciarletta, Yannick Presse.

Vincent Chevrier and Julien Vaubourg (MAIA team, LORIA) are external collaborators.

The MS4SG (multi-simulation for smart grids) project is part of a strategic action between Inria and EDF. It is a joint work between the Madynes and MAIA teams from Inria-NGEt and EDF R&D.

The aim of the project is to provide primitives based on AA4MM in order to enable the multi-modeling and the multi-simulation of smart-grids.

Smart grids are energy power grids (electricity) endowed with smart capabilities because of the use of information and communication technologies. It can be seen as a combination of at least 3 layers : the power grid, the network used to collect information and control the system and an Information System. In Smart-grids, power/electricity utilities and distributors have to deal with multiple and variable sources of energy and of errors, the mandatory integration of smaller energy providers and a very variable set of users, while maintaining the necessary quality of service. All this at a scale than can be as big as a country. The IT+Network layers add the needed « smart » to allow dynamic adaptation of the different components and help forecast and therefore pilot the entire system. Smart grids correspond to new challenges because it is needed to re-think the way electricity is supplied to customers.

The idea behind MS4SG is to use simulation to help develop and evaluate future grids architectures, novel supervision techniques and to eventually control these systems. Instead of building a « super simulator ». Our approach is stemming from our AA4MM work, and consists in integrating simulators (and models) coming from at least the following initial different domains: electrical networks, communication networks and information systems. As these domains can influence each other, smart-grids can be considered as a kind of complex system and we are faced with multi-modeling and multi-simulation issues. Models in these simulators (and therefore simulators) are heterogeneous (at least equation based and event based models). In addition, each domain has developed is own set of software that should ideally be reused.

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

The partnership with GE Healthcare started in 1993. In the past few years, it bore on the supervision of CIFRE PhD fellows on the topic of using a multi-modal framework and augmented reality in interventional neuroradiology. A new PhD thesis -Charlotte Delmas- started in April 2013 with the aim to perform 3D reconstruction of tools in interventional neuroradiology. Our goal is to help clinical gesture by providing the physician with a better understanding of the relative positions of the tools and of the pathology.

7. Bilateral Contracts and Grants with Industry

7.1. Inria-EDF Strategic action MS4SG

Participants: Vincent Chevrier, Julien Vaubourg.

Laurent Ciarletta and Yannick Presse (Madynes team, LORIA) are external collaborators.

The MS4SG (multi-simulation for smart grids) project is granted as a strategic action between Inria and EDF. This project is joint between the Inria teams Madynes and MAIA, and EDF R&D.

Smart grids are electric supply grids endowed with smart capabilities because of the use of information and communication technologies. This perspective of smart grids corresponds to new challenges ; in particular one must re-think the way electricity is supplied to customers and the power supply network is regulated.

The simulation approach can deal with the supervision and regulation of these systems. Such an approach implies to integrate simulators coming from different domains: electrical networks, communication networks and information systems. As these domains can influence each other, smart grids can be considered as a kind of complex system and we are faced with multi-modeling and multi-simulation issues; in particular we must deal with the fact that the models used in the different simulators are not of the same kind (heterogeneous simulations) and that we must link and re-use existing simulators that were designed to work alone on their own.

The aim of the project is to provide primitives based on AA4MM in order to enable the multi-modeling and the multi-simulation of smart grids.

MASAIE Project-Team (section vide)

NEUROSYS Team (section vide)

ORPAILLEUR Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. The BioIntelligence Project

Participants: Mehwish Alam, Yasmine Assess, Aleksey Buzmakov, Melisachew Chekol, Adrien Coulet, Marie-Dominique Devignes, Amedeo Napoli [contact person], Nicolas Pépin-Hermann, Malika Smaïl-Tabbone.

The objective of the "BioIntelligence" project is to design an integrated framework for the discovery and the development of new biological products. This framework takes into account all phases of the development of a product, from molecular to industrial aspects, and is intended to be used in life science industry (pharmacy, medicine, cosmetics, etc.). The framework has to propose various tools and activities such as: (1) a platform for searching and analyzing biological information (heterogeneous data, documents, knowledge sources, etc.), (2) knowledge-based models and process for simulation and biology in silico, (3) the management of all activities related to the discovery of new products in collaboration with the industrial laboratories (collaborative work, industrial process management, quality, certification). The "BioIntelligence" project is led by "Dassault Systèmes" and involves industrial partners such as Sanofi Aventis, Laboratoires Pierre Fabre, Ipsen, Servier, Bayer Crops, and two academics, Inserm and Inria. An annual meeting of the project usually takes place in Sophia-Antipolis at the beginning of July.

Two theses related to "BioIntelligence" are currently in preparation within the Orpailleur team. A first thesis is related to the mining of complex biological data using FCA and RCA techniques [37], [44]. The objective is to take advantage of Linked Open data in biology for helping the biologist querying complex data. There are needs to integrate data and knowledge from several web resources. Practical experiments will be led on biological data (clinical trials data and cohort data) also in accordance with ontologies lying at the NCBO BioPortal.

A second thesis is based on an extension of FCA involving Pattern Structures on complex data such as sequences and graphs [42], [41]. The idea is to extend the formalism of pattern structures to these complex data for being able to classify complex structures such as patient trajectories or molecular structures. The classification results (e.g. concept lattices) are expected to help practitioners in information retrieval tasks and specific problem solving.

7.2. The Quaero Project

Participants: Victor Codocedo [contact person], Ioanna Lykourentzou, Amedeo Napoli.

The Quaero project (http://www.quaero.org) is a program aimed at promoting research and industrial innovation on technologies for automatic analysis and classification of multimedia and multilingual documents. The partners collaborate on research and the realization of advanced demonstrators and prototypes of innovating applications and services for access and usage of multimedia information, such as spoken language, images, video and music.

In this framework, the Orpailleur team is working on information retrieval, document annotation and recommendation. The objective is to define methods and algorithms for achieving these complex tasks, based onKDDK techniques and especially the FCA technology.

A thesis is in preparation in the context of the Quaero project, where information retrieval and document annotation are especially studied, namely information retrieval guided by domain knowledge and classification of documents w.r.t. their annotations using FCA and pattern structures [48]. In addition, a related work was carried out on the reengineering of relational data within a concept lattice [58].

PAREO Project-Team (section vide)

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

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Our policy in terms of technological and industrial partnership consists in favoring contracts that quite precisely fit our scientific objectives.

A three-day consulting contract was conducted with Technicolor (Rennes) in December 2013.

E. Vincent is involved through his former team (PANAMA) in an 18-month bilateral research contract with Canon Research Centre France (Rennes) which ended in July 2013 and in a 30-month bilateral research contract with the SME Studio MAIA (Boulogne-Billancourt).

SCORE Team (section vide)

SÉMAGRAMME Project-Team (section vide)

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.

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

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.

TRIO Team (section vide)

VEGAS Project-Team (section vide)

VERIDIS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Project funded by EADS Foundation

Participants: Jingshu Chen, Marie Duflot-Kremer, Pascal Fontaine, Stephan Merz.

This two-year project (2013/2014) funds our work on the analysis of real-time Java programs described in section 6.2 , and in particular 12 months of the salary of Jingshu Chen as a post-doctoral researcher. It is complemented by funds granted by Région Lorraine.