Activity Report 2016

Section Highlights of the Team

5. Highlights of the Year

5.1. Highlights of the Year

The software SortMeRNA, developed by the team, has reached the number of 100 labs worldwide that have been using it to analyze their sequencing data. SortMeRNA is able to deal with large metagenomics projects with multiple applications in health (gut microbiome,...), environment (sea, lakes, soil,...), biotechnologies (bio-films,...). The first version was released at the end of 2012, and it is still under active maintenance.

DEFROST Team

5. Highlights of the Year

5.1. Highlights of the Year

New Research scientist

Olivier Goury was selected to join the team as new Inria research scientist.

Robosoft Grand Challenge

The team participated in the Robosoft Week in Livorno, with a workshop on simulation of soft robots held by Christian Duriez, Thor Bieze and Eulalie Coevoet. In addition, 2 prototypes were presented to the Robosoft Grand Challenge, reaching the 4th place of the competition.

Figure 2. (a) EchelonIII (b) SOFIA
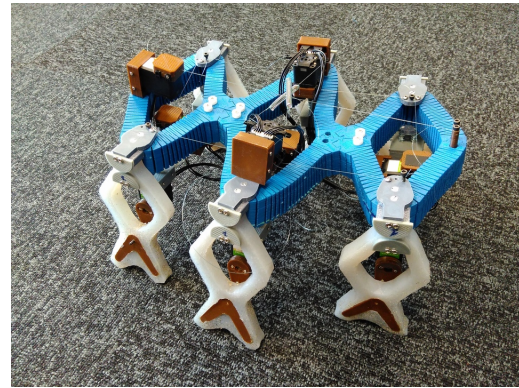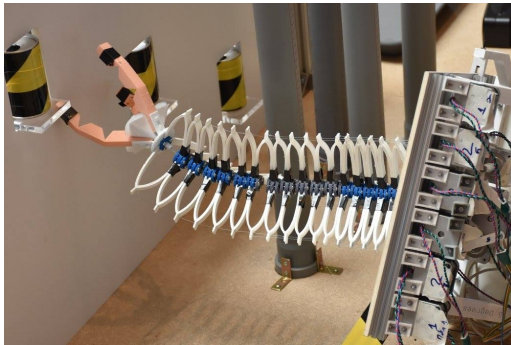
ERC evaluation grade A

The project COMOROS submitted for ERC Consolidator "fully met the ERC's excellence criterion" and evaluated as grade A. Unfortunately, it could not be funded, given the available budgetary resources of ERC for the call. But the region Haut-De-France should be able to finance a part of the project during the 3 coming years thanks to the FEDER funds.

DOLPHIN Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Patent with the company Beckman: the invention relates to the handling of samples of biological material. In one aspect, the invention relates to optimization techniques for aliquoting such biological samples in a manner which accounts for various conditions and requirements as they may exist when the samples are to be processed.

DREAMPAL Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

2016 is the last year of Dreampal's existence as an Inria project-team. Due to different scientific objectives, three of the members (S. Meftali, J.L. Dekeyser, P. Marquet) will create a group within the Cristal laboratory, while the team leader V. Rusu will collaborate with the 2xs team within Cristal. Frédéric Guyomarch joined the L2EP laboratory, and external collaborator Rabie Ben Atitallah continues his activity in the LAMIH laboratory in Valenciennes.

This activity report has been written by the team leader, based on the information available to him at the time of its writing. Any activity, e.g., by other team members, not reflected in the report, is only missing because of lack of input from the people concerned.

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

5. Highlights of the Year

5.1. Highlights of the Year

- The FIT facility has become an "Infrastructure de Recherche" (Infrastructure for Research) by the CD TGIR.

5.1.1. Awards

- Aziz Mbacke and Jad Nassar won the of the Hackaton at the SenZations summer school 2016, which opened them the doors of the UpRise Festival (http://uprisefestival.co/).

- Best paper award at the PIMRC 2016 conference .

- Viktor Toldov recipient of the award "Pepite 2016": (http://www.enseignementsup-recherche. gouv.fr/cid108805/3e-edition-du-prix-pepite-tremplin-pour-l-entrepreneuriat-etudiant-53-projets-recompenses.html)

BEST PAPERS AWARDS :

[47] **27th annual IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC)**. V. TOLDOV, L. CLAVIER, V. LOSCRÍ, N. MITTON.

<div align="center" style="color:red">**INOCS Team**</div>

5. Highlights of the Year

5.1. Highlights of the Year

- Creation of the Inria Innovation : Colinocs between Colisweb (start-up devoted to attended delivery service within the next 2 hours) and INOCS.

- Miguel Anjos joined us in September as part of the Inria International Chair program and will spend 20% of his time with us until 2020.

- A joint team between Ecole des Mines de St Etienne and INOCS involving N. Absi, D. Cattaruzza, D. Feillet, M. Ogier, F. Semet was finalist of the EURO/ROADEF Challenge 2016 devoted to an Inventory Routing Problem proposed by Air Liquid.

<p style="text-align:center;">LINKS Project-Team</p>

5. Highlights of the Year

5.1. Highlights of the Year

Certain Query Answering as Access Control

P. Bourhis [24] presented at **LICS** — the top conference in logic in computer science — a general framework for querying databases with visible and invisible relations. This work was done in cooperation with Oxford, Santa Cruez, and Bordeaux. It generalizes in a uniform manner the problems of certain query answering and access control for relational databases. Invisible relations are subject to the open world assumption possibly under constraints, while visible relations are subject to the closed world assumption. Bourhis then shows that the problem of answering Boolean conjunctive queries in this framework is decidable, and studies the complexity of various versions of this problem. It turns out that the complexity increases compared to the problem of certain query answering, given that the closed world assumption is adopted for the added visible relations.

Five ANR Projects

Two new ANR projects were accepted this year: *Delta* and *Headwork*. This makes Links a partner of 5 ANR projects in 2016.

PhD Defense of A. Boiret

The defense of the PhD thesis of A. Boiret [11] on "Normalization and Learning of Transducers on Trees and Words" under the supervision of J. Niehren and A. Lemay was highly appreciated by the reviewers. In particular, he illustrated very clearly how to learn top-down tree transformations subject to regular schema restriction [31], [33], [34]. Furthermore, he solve a problem open for more than 20 years on how to learn rational functions, i.e. word transducers with regular lookahead.

MAGNET Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- We have been successful in many calls: ERC PoC project SOM (JAN RAMON leader), ANR project GRASP (PASCAL DENIS leader), ANR project PAMELA (MARC TOMMASI is the scientific coordinator), ANR project REM (PASCAL DENIS local leader), ADEME project MUST (JAN RAMON leader), Inria Associate Team LEGO (AURÉLIEN BELLET local leader).

- Scientific advances have been recognized by the community, in top ranked conferences and journals such as ICML, NIPS, JMLR, EMNLP, EACL and IJCAI.

5.1.1. Awards

- CHLOÉ BRAUD, who was supervised by PASCAL DENIS from 2012 to 2015, received the 2016 PhD Award from ATALA, the French NLP association.

- PAUL VANAESEBROUCK, who was supervised par AURÉLIEN BELLET and MARC TOMMASI, has reveived the "Grand Prix du stage de Recherche" from École Polytechnique Paris for his internship in MAGNET (see Section 7.1).

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

5. Highlights of the Year

5.1. Highlights of the Year

The team obtained two striking results in 2016:

- In collaboration with O. Blondel, T. Franco, and P. Gonçalves, M. Simon has made significant progress towards the *weak KPZ universality conjecture*, which states that a large class of one-dimensional weakly asymmetric conservative systems should converge to the KPZ equation, cf. [28], [7].

- In collaboration with F. Otto, M. Duerinckx and A. Gloria developed a complete theory of fluctuations in stochastic homogenization, cf. [39].

<div align="center">

MINT Project-Team

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4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. *Evita*

EVITA is a tactile feedback tablet, produced by Hap2U SME company, based in grenoble. It is presented at CES in january 2017, the SME has been awarded a CES innovation award. This device is issued from a strong collaboration with MINT group. Eric Vezzoli PhD thesis, contributed significantly to this device. EVITA is a very generic interaction device, and several projects are currently being discussed for understanding the fields of applications of this device. It is also, in particular, the hardware support for our haptic book for children, described below, that is our second highlight for this raweb.

4.1.2. *Haptic book*

The first digital book augmented with a high fidelity feedback has been released in October 2016. Based on a scenario and illustrations made by Dominique Maes - an artist from Belgium - this haptic book was presented for the first time during "la nuit des bibliothèques" in Lille. The popularity of this project as well as its possible social outcomes were underlined in a paper in a national magazine ("Science et Avenir", November 2016)

4.1.3. *Forum Oeuvres et Recherches*

MINT played an active role in the "Oeuvres et recherches" project (http://www.cristal.univ-lille.fr/oeuvres-et-recherches/), a platform that aims at higlighting and supporting collaborations between researchers and artists in the Hauts-de-France and in Belgium. Since 2010, these collaborations have resulted in significant contributions for these two communities at the regional and national levels. Organised at the Université de Lille on December 2nd 2016, the F O O R event was an opportunity to review more than five years of art-science projects in the region and Belgium, highlighted more than 40 art-science projects, and more importantly to prepare the future and discuss strategies for supporting such projects.

4.1.4. *ControllAR*

The ControllAR project, started in 2016, investigates the appropriation of visual feedback on control surfaces for multimedia production systems. It has already yielded many results. The system and results of a study on electronic musicians were presented both as a paper and as a demo at the ACM Internation conference on Surfaces and Spaces (ISS 16) where it received a best demo award. The software was released and is available at http://forge.lifl.fr/ControllAR. ControllAR was also presented during multiple events, both for the general public and for electronic musicians. The project continues with the design of a portable hardware solution and a long term study of the effects of the system on musicians' playing techniques.

4.1.5. *Awards*

- Best demo award for *ControllAR : appropriation of visual feedback on control surfaces*   [16] @ ACM International Conference on Interactive Surfaces and Spaces (ISS 16).

- Best work in progress at Eurohaptics 2016 for the work The human perception of transient frictional modulation, David Gueorguiev, Eric Vezzoli, André Mouraux, Betty Semail, Jean-Louis Thonnard

- SME Hap2U had a "CES innovation award", based on the collaboration that MINT group has with them (E-vita tactile feedback tablet) at CES (january 2017).

Mjolnir Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Personnel

Mathieu Nancel joined us as an Inria researcher in November.

Marcelo Wanderley joined us in February as part of the Inria International Chair program and will spend 20% of his time with us until 2020.

Ed Lank, Associate Professor at the University of Waterloo, joined us in September for a long-term visit (10+ months) funded by Région Hauts-de-France and Université Lille 1.

In partnership with Campus France and Inria, Mitacs' Globalink Research Award program sponsored the visits of three canadian students in our group: Nicholas Fellion (Carleton University), Hrim Mehta (Ontario Institute of Technology) and Aakar Gupta (University of Toronto).

5.1.2. Publications & dissemination

Mjolnir presented seven papers and one "late-breaking work" at the ACM CHI 2016 conference in May, the most prestigious conference in our field.

The *Animated transitions* web site launched in March illustrates previous works by Fanny Chevalier and others on this topic (Histomages, Diffamation and Gliimpse).

5.1.3. Awards

"Honorable mention" (top 5% of the 2300+ submissions) from the ACM CHI 2016 conference to the following three papers:

- "Egocentric analysis of dynamic networks with EgoLines", from J. Zhao, M. Glueck, F. Chevalier, Y. Wu & A. Khan
- "Modeling and understanding human routine behavior", from N. Banovic, T. Buzali, F. Chevalier, J. Mankoff & A. Dey
- "Direct manipulation in tactile displays", from A. Gupta, T. Pietrzak, N. Roussel & R. Balakrishnan

"Springer award for best doctoral contribution" to Amira Chalbi-Neffati at the IHM 2016 conference.
BEST PAPERS AWARDS :
[40] **CHI '16 - Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems**. J. ZHAO, M. GLUECK, F. CHEVALIER, Y. WU, A. KHAN.
[23] **ACM CHI Conference on Human Factors in Computing Systems 2016**. N. BANOVIC, T. BUZALI, F. CHEVALIER, J. MANKOFF, A. K. DEY.
[29] **CHI 2016 - Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems**. A. GUPTA, T. PIETRZAK, N. ROUSSEL, R. BALAKRISHNAN.

MODAL Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

The major highlight of Modal is related to transfer of its research towards the private sector. In 2016, several major bilateral contracts have been signed between Modal and leading international companies based in Hauts-de-France. Those collaborations directly proceed from the fundamental research carried within the team (see Section "Bilateral Contracts and Grants with Industry").

NON-A Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

UCoCoS

The H2020 project UCoCoS (Understanding and Controlling of Complex Systems, supervisors: W. Michiels, J.-P. Richard, H. Nijmeijer, 2016-2020) has started effectively this year: kick-off meeting in Eindhoven in March and, at the end of this year, recruitment of the 6 PhD students (including 4 jointly with Lille: H. Silm, J. Thomas, D. Dileep, Q. Voortman) in the 3 hosting institutions.

5.1.1. *Awards*

D. Efimov is Outstanding IEEE TAC reviewer.

5. Highlights of the Year

5.1. Highlights of the Year

The paper [31], written by Giacomo Dimarco, Raphaël Loubère, Jacek Narski and Thomas Rey presents a new deterministic numerical scheme for the resolution of the full 7d Boltzmann equation. The scheme combines a robust and fast method for treating the transport part based on an innovative Lagrangian technique supplemented with fast spectral solvers to treat the collision operator. This approach along with several implementation features related to the parallelization of the algorithm permits to construct an efficient simulation tool which is numerically tested against exact and reference solutions on classical problems arising in rarefied gas dynamics.
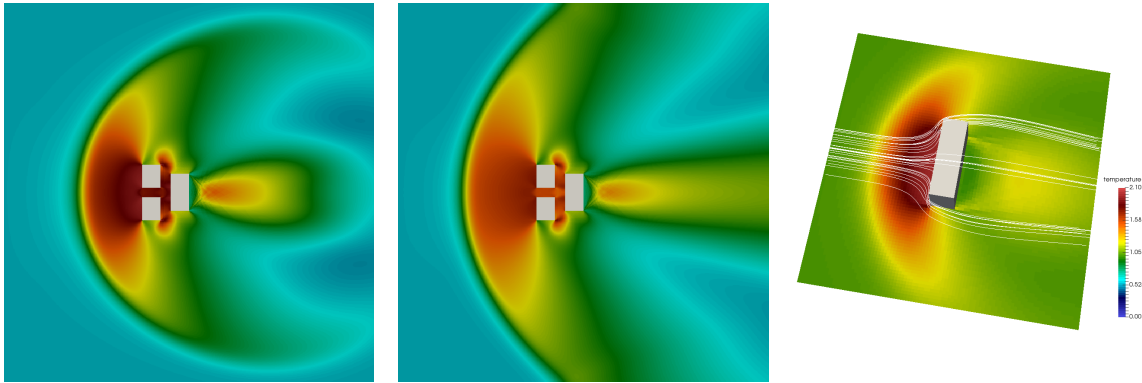

Figure 1. Simulation of a space shuttle atmospheric reentry (pictures from [31])

The paper presents results up to the very challenging 3D×3D case for unsteady flows arising during a space shuttle atmospheric reentry (which was simulated in the deterministic case in the paper for the first time up to our knowledge), which may serve as benchmark for future comparisons between different numerical methods for solving the multidimensional Boltzmann equation. For this reason, the paper also provide for each problem studied details on the implementation, computational cost and memory consumption as well as comparisons with the more standard BGK model or the limit model of compressible Euler equations.

RMOD Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Release of Pharo 5.0

We released a new version Pharo (Pharo 5.0) completly revisited with fundamental changes in the VM (object representation, compiler, ...)

5.1.2. HDR defenses

Anne Etien defended her HDR thesis.

5.1.3. Pharo web for the enterprise

A new book on Pharo.

5.1.4. Guillermo Polito hired as a CNRS engineer

Guillermo Polito a former PhD student in RMod was hired as a CNRS research engineer. This acknolewdges the quality of his research and work.

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

5. Highlights of the Year

5.1. Highlights of the Year

- Grill, Valko & Munos gave an oral presentation at NIPS. Oral presentations at NIPS are rare: out of 2500+ submissions, only 1.8% are presented orally.
- Using a deep learning approach (sparse denoising autoencoders), Strub, Mary & Gaudel have obtained the best ever published results on the data from the Netflix challenge on recommendation systems. 10 years ago, such an achievement was worth 1M$.

SPIRALS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Makitoo, the start-up company founded by Martin Monperrus and Nicolas Petitprez received the Bpifrance *Création d'entreprise innovante* award, which is a major award in France for startup companies, in the category *Création-développement*.

Makitoo won also a NETVA award from the French ministry of foreign affairs in order to develop its activities in the USA.

Romain Rouvoy has been awarded a Institut Universitaire de France (IUF) junior fellowship for 5 years (2016-21). IUF is an excellence award that is only granted to the top 2% of faculty members in French universities. The award recognizes the excellence of the research activities conducted by Romain Rouvoy.

Laurence Duchien has been elected for a 2-year term in the executive committee of the IEEE Technical Council on Software Engineering (TCSE). The IEEE TCSE helps advance software engineering research and practice. The executive committee determines TCSE policy and the nature of TCSE activities.