Activity Report 2013

Section highlights of the Team

PERCEPTION, COGNITION, INTERACTION

AXIS Project-Team

2.2. Highlights of the Year

- Y. Lechevallier gave an **invited talk** "Partitioning Methods On Dissimilarity Matrices Set" related to this publication [20] (cf. Section 6.2.8) at the First European Conference on Data Analysis (ECDA 2013) (with around 300 participants) jointly hosted by the two Classification Societies (GkKI in Germany and SFC in France) in July at Luxembourg.

- **BIOVISION 2013**, the World Life Sciences Forum: B. Trousse was invited as **panellist** in the prospective session "eHealth: a coming medical revolution?" at the major event BIOVISION 2013, held March 24-26, 2013 in Lyon, France. With over 3,000 participants, 200 high-level speakers and more than 30,000 Internet followers, BIOVISION is the most-attended multi-stakeholder meeting for all life sciences'players. B. Trousse illustrated the notion of living lab with three concrete e-health experiences from three French living labs (Autonom'lab - Limousin, e-care - Lyon, Living Lab High Alps Living Lab -05) and argued on the importance for the public authorities to appropriate this type of instruments which are living labs;

- **2030 Prospective (ADEME)**: B. Trousse was invited by ADEME and Chronos firm among relevant interdisciplinary experts for analysing the ICT & Building challenges at 2030 horizon and for participating at one 2-days seminar at ADEME (Sophia Antipolis);

- **MyGreenServices - Good Practice Prize** (Category: Project proposals, initiatives, methodologies and studies) by the **International Design for All Foundation** for Awards 2014 which will be at Paris in February 2014; AxIS managed a complete deployment of a Living Lab Experiential Design process involving more than 50 active citizen and 13 citizen pollution fixed and mobile sensors. The impact in terms of behaviour change using MyGreenServices was very promising;

- **FocusLab Platform (CPER Telius 2010-2013)**: we completed a first web-based application allowing the reservation of hardware, software or books (cf. Section 6.6);

- **Signature of a Memorandum of Understanding** (MoU) between B. Trousse, President of France Living Labs as Inria representative of ICT Usage Lab and Jarmo Eskelinen, Chair of ENoLL the European Network of Living Labs;

- D. Robache is member of the Department of Research Team Assistants of Inria Sophia Antipolis which receives the Research Support Department Inria Award in 2013.

GALAAD Project-Team

2.1. Highlights of the Year

The paper [15] has been awarded the best paper price, 1st place, of the SIAM conference on Geometric and Physical Modeling 2013 (Denver, USA, Nov. 11-14).

ABSTRACTION Project-Team

2.2. Highlights of the Year

Patrick and Radhia Cousot have received in 2013 the SIGPLAN Achievement award, for the invention, development, and application of abstract interpretation http://www.sigplan.org/Awards/Achievement/Main.

ALF Project-Team (section vide)

AOSTE Project-Team

2.2. Highlights of the Year

The 2013 edition of the RTNs conference was organized in Sophia-Antipolis, with Robert de Simone as General Chair and Liliana Cucu-Grosjean as keynote speaker. Rob Davis, from the University of York, was granted a five-year Inria International Chair position in our team at Rocquencourt.

ARIC Project-Team

2.2. Highlights of the Year

- Jean-Michel Muller received the CNRS-INS2I silver medal.
- Damien Stehlé was awarded a "starting" ERC grant for his project "Euclidean lattices: algorithms and cryptography" (LattAC).
- Vincent Lefèvre, Nicolas Louvet, and Jean-Michel Muller received the "Prix La Recherche pour les Sciences de l'Information".

ATEAMS Project-Team

2.2. Highlights of the Year

- Paul Klint was Knighted Officer in the order of Oranje Nassau based on his contributions to science and education.
- Paul Klint was appointed Research Fellow, Centrum Wiskunde & Informatica

CAIRN Project-Team

2.2. Highlights of the Year

The paper has been nominated for the best paper award at IEEE/ACM ICCAD, one of the major event in Design Automation.

BEST PAPERS AWARDS :

[56] **IEEE/ACM International Conference on Computer-Aided Design (ICCAD)**. K. PARASHAR, D. MENARD, O. SENTIEYS.

CAMUS Team

2.2. Highlights of the Year

- Sept. 2013, Cédric Bastoul joined the CAMUS team as a Professor of the University of Strasbourg.

CARAMEL Project-Team

2.2. Highlights of the Year

- A spectacular new result has been obtained in the context of the cryptanalysis of the discrete logarithm problem in certain types of fields [22]. The complexity for solving this hard problem has been reduced from « sub-exponential » complexity, roughly $\exp(O(n^{1/3}))$ for an input size n, to the much lower « quasi-polynomial » complexity written as $\exp(O((\log n)^2))$. As a result, a whole range of cryptographic proposals have lost momentum, notably proposals related to pairing-based cryptography over small characteristic fields.

- Still in the realm of the computation of discrete logarithm, a new record computation has been completed by the team for binary fields of *prime* extension degree [15], using the Function Field Sieve algorithm. This establishes a useful comparison point between the Function Field Sieve and the newly proposed algorithm discussed above.

- The 2.0 release of the CADO-NFS software package, developed by the team, was made available in november. This releases incorporates an important number of improvements over the previous release which was 2 years earlier. CADO-NFS is available from the project page http://cado-nfs. gforge.inria.fr/.

CARTE Project-Team

2.2. Highlights of the Year

Our team made remarkable progress into the difference between "real world" systems and artefacts due to exact (infinite) precision computations. Olivier Bournez, Daniel Graça and Emmanuel Hainry succeeded in proving an equivalence between robustness and computability: Robust dynamical systems have computable dynamical properties [12], a strong evidence that "real world" systems will not exhibit undecidability properties.

Another highlight of the year is a paper by Hugo Férée, Mathieu Hoyrup and Walid Gomaa, accepted in LICS 2013 [19] that provides a systematic approach to define and analyse the complexity of algorithms acting on infinite precision numbers (infinite words).

CASCADE Project-Team (section vide)

CASSIS Project-Team

2.4. Highlights of the Year

- We have released the first version of *Belenios*, an electronic voting protocol based on a previous system, Helios. *Belenios* is an open-source voting system that offers transparent and verifiable elections. We have also signed a contract with a French company on electronic voting, Voxaly, to discuss their solution and a possible adaptation to *Belenios*' concepts.

- We have found a weakness in the biometric passports: under certain circumstances, it is possible to trace a passport holder, despite the existing security measures. Our flaw has been reported in the journals "Pour la Science" and "Journal du CNRS".

CELTIQUE Project-Team

2.2. Highlights of the Year

The European Association for Programming Languages and Systems (EAPLS) Best PhD Dissertation Award 2012 has been won by Delphine Demange (ENS Cachan - Brittany Extension and the Celtique team at IRISA / Inria Rennes, advisors Thomas Jensen and David Pichardie), for her dissertation on "Semantic Foundations of Intermediate Program Representations".

The thesis prize Gilles Kahn 2013, awarded by the Société Informatique de France (SiF) and sponsored by Academy of Sciences, was awarded to Delphine Demange for her dissertation "Semantic Foundations of Intermediate Program Representations" (ENS Cachan - Brittany Extension and the Celtique team at IRISA / Inria Rennes, advisors Thomas Jensen and David Pichardie).

COMETE Project-Team (section vide)

COMPSYS Project-Team

2.5. Highlights of the Year

For 2013, from the point of view of organization, funding, collaborations, the main points to highlight are:

- The Zettice startup project, initiated by Alexandru Plesco and Christophe Alias, won the *concours OSEO 2013* grant (Banque Publique d'Investissement, 40 Keuros) and the *"most promising start-up award"* at SAME 2013. See more details in Section 7.3 .

- Laure Gonnord was hired as assistant professor at ENS-Lyon, she is now a permanent member of Compsys. Fabrice Rastello has left Compsys and will continue his research in Grenoble.

- The collaborations with Colorado State University (S. Rajopadhye) and Ohio State University (Sadayappan) were very successful. New topics of collaboration with the Inria Parkas and Camus teams have started.

- From April 2013 to July 2013, Compsys organized 4 scientific events on compilation, regrouped in a larger and coherent *thematic quarter on compilation* ², with international audience and visibility. It was mainly funded by the Labex MILYON, see details in Section 9.1 .

From a scientific point of view, the shift, in Compsys III, towards the analysis of parallel programs, the extensions of the polyhedral model, both in terms of techniques and applications, and the code optimizations based on trace analysis has been already fruitful, see the section "New Results", in particular:

- Innovative contributions on parametric tiling [8], [5] as extensions of the polyhedral model.

- A groundbreaking introduction of polyhedral techniques for the analysis of parallel programs, in particular X10 [10], [7].

- Several important contributions (e.g., [2]) that demonstrate the interest of mixing trace analysis and static analysis for code (in particular locality) improvements.

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²http://labexcompilation.ens-lyon.fr

CONTRAINTES Project-Team (section vide)

CONVECS Project-Team (section vide)

CRYPT Team

2.3. Highlights of the Year

Phong Nguyen and Xiaoyun Wang obtained a 973 grant from China's Ministry of Science and Technology (MOST): the so-called 973 grants are China's largest grants for fundamental research.

BEST PAPER AWARD :

[19] **ISSAC '13 - 38th international symposium on International symposium on symbolic and algebraic computation**. J. BI, Q. CHENG, M. ROJAS.

<p style="text-align:center; color:red;">**DEDUCTEAM Exploratory Action**</p>

2.3. Highlights of the Year

The Version 2 of Dedukti has been released. Gilles Dowek has been invited speaker to CSR, Hapoc, and to the Colloquium of the University Pierre et Marie Curie. David Delahaye has been an invited speaker of PSATTT.

DICE Team

2.2. Highlights of the Year

The team has been launched this year and has gained some visibility after a tribune in the French daily Le Monde which obtained more than 1500 "like" on the day of its publication.

"Les données, puissance du futur", S. Grumbach, S. Frénot, Le Grand Débat, Le Monde, 8 janvier 2013

DREAMPAL Team (section vide)

ESPRESSO Project-Team

2.4. Highlights of the Year

Polarsys is an Eclipse Industry Working Group focusing on open source tools for the development of embedded systems. After previous years experimentation, POP, A Polychronous Modeling Environment on Polarsys, has been approved as open source project under the Polarsys Top-Level Project, which is operating under the auspices of the Polarsys Industry Working Group.

FORMES Team

2.3. Highlights of the Year

The project has released a new version of its **SimSoC** simulation software, as an open source software release 0.8, available from http://gforge.inria.fr/projects/simsoc/

GALLIUM Project-Team

2.2. Highlights of the Year

Didier Le Botlan (INSA Toulouse) and Didier Rémy received the ACM SIGPLAN Most Influential ICFP Paper Award for their ICFP 2003 paper, *MLF: Raising ML to the power of System F* [44].

GEOMETRICA Project-Team

2.2. Highlights of the Year

Jean-Daniel Boissonnat has obtained an "advanced" grant from the ERC (European Research Council) for his project Gudhi : Geometry Understanding in Higher Dimensions.

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

2.2. Highlights of the Year

- *Number-Theoretic Algorithms for Asymmetric Cryptology* Workshop. On June 20 and 21, 2013, GRACE hosted an international workshop on number-theoretic algorithms for asymmetric cryptology (with the support of Digicosme). Our invited speakers included Steven Galbraith (Auckland), Florian Hess (Oldenburg), Razvan Barbulescu (LORIA), Andreas Enge (Inria Bordeaux), Antoine Joux (UVSQ and Cryptoexperts), and Vadim Lyubashevsky (Inria Paris–Rocquencourt). Forty researchers attended over the two days. This workshop saw the first public announcement and presentation of what is undoubtedly the most remarkable new result in algorithmic number theory in 2013, if not the last decade: Barbulescu, Gaudry, Joux, and Thomé's quasi-polynomial time algorithm for discrete logarithms in a large class of finite fields.

- ISN-Privacy. In year 2013, N. Boujemaa's proposal for an *Institut de la société du numérique* (Digital Society Institute) was accepted within IDEX Paris-Saclay. This proposal aims to foster interdisciplinary research involving both computer scientists and researchers in the humanities. Daniel Augot joined researchers from project-teams COMETE (Saclay) and SMIS (Paris–Rocquencourt) in regular monthly discussions with economists and lawyers; a seminar will be held in Summer 2014. Funding was allocated from the IDEX to the PAIP (*Pour une Approche Interdisciplinaire de la Privacy*) project for all the partners of the privacy group.

- A special issue of *Designs, Codes and Cryptography* co-edited by Daniel Augot, devoted to the WCC2011 conference proceedings, was published in January 2013 [16].

Hycomes Team

2.1. Highlights of the Year

Albert Benveniste has been elected IFAC Fellow [1] for his fundamental contributions to stochastic systems theory, and for connecting control, signal processing, and real-time software development.

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[1] http://www.ifac-control.org/awards/ifac-fellows

INDES Project-Team (section vide)

LFANT Project-Team

2.2. Highlights of the Year

V. Verneuil's PhD thesis work, co-supervised by K. Belabas and carried out in the company Inside Secure, has been awarded the "Prix de thèse AMIES 2013" of AMIES, l'Agence pour les Mathématiques en Interaction avec l'Entreprise et la Société. The prize recognises outstanding work securing elliptic curve cryptographic systems against side-channel attacks on smartcards and an exceptional integration into the company, see http://www.agence-maths-entreprises.fr/a/?q=fr/node/292.

After two years of development, version 2.6.0 of the Pari/GP computer algebra system has been released, incorporating numerous improvements related to the programming language and the implementation of number fields, finite fields and elliptic curves. The new release maintains Pari/GP as the world leader for number theoretic computations.

MARELLE Project-Team (section vide)

MEXICO Project-Team

2.2. Highlights of the Year

- We have made two major progresses in diagnosis this year:
    - For non-diagnosable discrete event systems, *active* diagnosis aims at synthesizing a partial-observabion based control for the system in order to make it diagnosable. While some solutions had already been proposed for the active diagnosis problem, their complexity remained to be improved. In [40], we solved both the active diagnosability decision problem and the active diagnoser synthesis problem, proving that (1) our procedures are optimal w.r.t. to computational complexity, and (2) the memory required for the active diagnoser produced by the synthesis is minimal. Furthermore, focusing on the minimal delay before detection, we establish that the memory required for any active diagnoser achieving this delay may be highly greater than the previous one. So we refine our construction to build with the same complexity and memory requirement an active diagnoser that realizes a delay bounded by twice the minimal delay. An extension to *probabilistic* systems has been accepted to *FoSSaCS 2014*.
    - In [41], we present a methodology for fault diagnosis in concurrent, partially observable systems with additional fairness constraints. In this *weak* diagnosis, one asks whether a concurrent chronicle of observed events allows to determine that a non-observable fault will inevitably occur, sooner or later, on any maximal system run compatible with the observation. The approach builds on strengths and techniques of unfoldings of safe Petri nets, striving to compute a compact prefix of the unfolding that carries sufficient information for the diagnosis algorithm. Our work extends and generalizes the unfolding-based diagnosis approaches by Benveniste et al. as well as Esparza and Kern. Both of these focused mostly on the use of sequential observations, in particular did not exploit the capacity of unfoldings to reveal inevitable occurrences of concurrent or future events studied by Balaguer et al. [19]. Our diagnosis method captures such indirect, revealed dependencies. We develop theoretical foundations and an algorithmic solution to the diagnosis problem, and present a SAT solving method for practical diagnosis with our approach.
- The article *Complexity Analysis of Continuous Petri Nets* by Estébaliz Fraca and Serge Haddad [39] received the *outstanding paper award* at the *International Conference on Application and Theory of Petri Nets and Concurrency, June 24-28, 2013, Milano, Italy.*

BEST PAPER AWARD :

[39] **34th International Conference on Applications and Theory of Petri Nets (ICATPN'13)**. E. FRACA, S. HADDAD.

MUTANT Project-Team

2.2. Highlights of the Year

../../../../projets/mutant/IMG/ONFI2.jpg

Figure 2. Antescofo presentation and demo in Bercy, Ministry of Industry.

Antescofo has been awarded the Industry prize by the French Minister of Industry, for its R&D and upcoming industrial applications.

Antescofo has been presented at the MIF Show (salon Made In France) invited by the ministère du redressement productif (November 2013).

Invited Demonstration at the 10th anniversary of La Recherche Prize.

PAREO Project-Team (section vide)

PARKAS Project-Team

2.2. Highlights of the Year

Robin Morisset was Awarded a Google Doctoral Fellowship.

Louis Mandel and Marc Pouzet received a reward for the paper introducing the ReactiveML language for the first time and presented at the French conference JFLA 2005 ("On the occasion of this quarter century, the program committees and steering selected four outstanding contributions from the articles published in JFLA past decade.")

Louis Mandel has been hired in Sept. 2014 at Collège de France, as an Assistant Professor.

PARSIFAL Project-Team

2.2. Highlights of the Year

- The team organized the LIX Colloquium 2013: The Theory and Application of Formal Proofs, November 5–7. Webpage: http://www.lix.polytechnique.fr/colloquium2013/

PI.R2 Project-Team

2.2. Highlights of the Year

The Coq team received the 2013 ACM SIGPLAN Programming Language Software Award, which was presented at POPL'14 in San Diego. To quote: "The Programming Languages Software Award is given by ACM SIGPLAN to an individual or an institution to recognize the development a software system that has had a signicant impact on programming language research, implementations, and tools. The impact may be reflected in the wide-spread adoption of the system or its underlying concepts by the wider programming language community either in research projects, in the open-source community, or commercially."

POLSYS Project-Team

2.2. Highlights of the Year

- Mohab Safey El Din was invited speaker in the International Symposium on Symbolic and Algebraic Computation (ISSAC), held in Boston, June 26-29, 2013.

- In [6] we investigate the security of HFE and Multi-HFE schemes. Our attacks are based on solving the MinRank problem. We prove that they are polynomial in the degree of the extension field for all possible practical settings used in HFE and Multi-HFE.

- In [11] we consider an algorithm to solve the DLP problem on Edwards curves, which are a well-known family of elliptic curves. We exploit the symmetries and the structure of twisted Edwards and twisted Jacobi intersections curves to gain an exponential factor $2^{\omega(n-1)}$ in the complexity bound where ω is the exponent of matrix multiplication.

- In [17] we give an explicit upper bound for the algebraic degree and an explicit lower bound for the absolute value of the minimum of a polynomial function on a compact connected component of a basic closed semialgebraic set when this minimum is not zero and is attained.

PRIVATICS Team

2.2. Highlights of the Year

The project Mobilitics has made significant advances in the context the Inria-CNIL convention in 2013. Major improvements have been made in the software, which include new capabilities and improved analysis (even for encrypted streams) for the two major systems that are iOS 6.2 and Android 4.1. A first phase of experiments for iOS took place in early 2013 with volunteers from the CNIL. It resulted in a press conference (April 2013) and a large media exposure. A second phase of experiments will take place in 2014 for Android. More targeted work on the our side also led to advances in understanding the ecosystem of mobile applications and the flows of personal information.

We have published at CODASPY 2013 [33] a new formal framework for the analysis of architectural choices. The privacy by design approach has already been put into practice in different application areas. We believe that the next challenge today is to go beyond individual cases and to provide methodologies to explore the design space in a systematic way. As a first step in this direction, we focus on the data minimization principle and consider different options using decentralized architectures in which actors do not necessarily trust each other. We propose a framework to express the parameters to be taken into account (the service to be performed, the actors involved, their respective requirements, etc.) and an inference system to derive properties such as the possibility for an actor to detect potential errors (or frauds) in the computation of a variable. This inference system can be used in the design phase to check if an architecture meets the requirements of the parties or to point out conflicting requirements.

<h1 style="text-align:center; color:red;">PROSECCO Project-Team</h1>

2.2. Highlights of the Year

This year, we published 6 articles in international journals and 11 articles in peer-reviewed international conferences, including presitigious conferences such as IEEE S&P (1), ACM CCS (2), Usenix Security (1), ESORICS (2), and POST (3). In addition to these, we published 1 PhD thesis and several technical reports. We also have 3 articles already accepted for publication in international conferences in 2013: POPL (2), NDSS (1).

We released updates to several verification tools and software packages. We discovered and reported major security vulnerabilites in dozens of commercial software packages, hardware devices, and websites. The work of our group also spun-off a new startup company created by Graham Steel, and we continue to collaborate with this startup.

Of our work published in 2013, we would like to highlight the following:

- Our paper in IEEE S&P 2013 [21] presents the first cryptographically verified implementation of TLS.

- Our work on the computational analysis of cryptographic protocols yielded new results and major publications [19], [26].

- Our work on formally analyzing web application security uncovered major attacks on browsers and websites and proposed novel language-based verified solutions [20], [29], [25].

SECRET Project-Team

2.2. Highlights of the Year

- *Cryptanalysis of several recently proposed lightweight block ciphers:* The area of lightweight primitives has drawn considerable attention over the last years, due to the need for low-cost cryptosystems for several emerging applications like RFID tags and sensor networks. The strong demand from industry has led to the design of a large number of lightweight block ciphers, with different implementation features. In this context, the need for a significant cryptanalysis effort is obvious. The demand from industry for clearly recommended lightweight ciphers requires that the large number of these potential candidates be narrowed down. In this context, the project-team has obtained cryptanalytic results on several recently proposed lightweight block ciphers, including an attack against the full cipher KLEIN-64, the best known attack against a round-reduced version of PRINCE, and some distinguishers on the internal permutation of LED.

- *Cryptanalysis of a variant of the McEliece public-key cryptosystem based on some wild Goppa codes:* The original McEliece cryptosystem proposed in 1978 uses the class of classical binary Goppa codes as private codes. Many other classes of codes have been suggested since the original proposal, but most of them have been cryptanalysed, while the class of Goppa codes still resists all structural attacks. Then, the use of a more general family of Goppa codes over $\mathbf{F}_q$, $q \geq 2$, named wild Goppa codes, has been proposed in 2010 by Bernstein *et al.* in order to reduce the key size of the system. Our recent work leads to an attack which allows to recover the private key in polynomial time when wild Goppa codes over a quadratic finite field extension are used. This is the very first structural attack of the McEliece cryptosystem when some Goppa codes are used. The key-point in the attack is the behaviour of these codes with respect to component-wise product of codes. A similar technique has also been exploited for breaking some other variants of the McEliece system, including one based on Reed-Solomon codes.

- *Experimental demonstration of long-distance continuous-variable quantum key distribution:* Distributing secret keys with information-theoretic security is arguably one of the most important achievements of the field of quantum information processing and communications. The rapid progress in this field has enabled quantum key distribution in real-world conditions and commercial devices are now readily available. Quantum key distribution systems based on continuous variables provide the major advantage that they only require standard telecommunication technology. However, to date, these systems have been considered unsuitable for long-distance communication. In collaboration with experimental groups, we have overcome all previous limitations and demonstrated for the first time continuous-variable quantum key distribution over 80 km of optical fibre. Our results correspond to an implementation guaranteeing the strongest level of security for quantum key distribution reported so far for such long distances and pave the way to practical applications of secure quantum communications.

SECSI Project-Team (section vide)

SPADES Team (section vide)

Specfun Team

2.3. Highlights of the Year

This year, we complete a first work emblematic of the interdisciplinary activity of the team: a computer-algebra based formal proof of irrationality of the mathematical constant $\zeta(3)$, that is, the evaluation at 3 of the Riemann zeta function of number theory. This motivated collateral enhancements of libraries for the interactive theorem prover Coq. This is described in more details in the new results.

SUMO Team

2.2. Highlights of the Year

- Loïc Hélouët and Hervé Marchand were co-chairs of the conference MSR 2013 (Modélisation des Systèmes Réactifs), located in Rennes this year and organized by SUMO (Laurence Dinh, Loïc Hélouët, Hervé Marchand and Paulin Fournier).

- ANR Stoch-MC has been accepted in 2013, led by SUMO (Blaise Genest (PI), Nathalie Bertrand and Éric Fabre). Its aim is to provide scalable algorithms to analyse stochastic systems.

TASC Project-Team

2.2. Highlights of the Year

1. Best young researcher paper for Jean-Guillaume Fages and Tanguy Lapègue at the 19th International Conference on Principles and Practice of Constraint Programming.

2. Silver medal for the library Choco at the MiniZinc International Challenge 2013 in the *open class* category.

3. Silver medal for the library Choco at the MiniZinc International Challenge 2013 in the *parallel search* category.

4. Bronze medal for Florian Richoux at the AI competitions organized at the conferences AIIDE 2013 and CIG 2013 for developing an artificial intelligence, AIUR, to play the real time strategy game $StarCraft^{tm}$, using both machine learning and constraint-based techniques.

BEST PAPERS AWARDS :

[30] **19th International Conference on Principles and Practice of Constraint Programming (CP'13)**. J.-G. FAGES, T. LAPÈGUE.

TOCCATA Team

2.2. Highlights of the Year

- The *Castor informatique*http://castor-informatique.fr/, is an international competition to present computer science to pupils (from *6ème* to *terminale*). More than 170,000 teenagers played on more than 30 proposed exercises in November 2013. Two members of the Toccata team (S. Boldo and A. Charguéraud) belong to the organization committee (5 people).

- The full formalization of the JavaScript language specification (ECMAScript 5) was recently completed by the *JsCert* team [24], which includes A. Charguéraud and 7 collaborators from Imperial College and Inria Rennes (http://jscert.org). The formalization, which involves more than 10,000 lines of code and an inductive semantics with over 600 reduction rules, is the result of 2 years of effort. It lead to the discovery of bugs in the official standard, in the official test suites, and in all major browsers. In particular, it has raised the interest of several members of the ECMAScript standardization committee, and that of the developers of secure subsets for JavaScript.

- J.-C. Filliâtre was invited as keynote speaker ("One Logic To Use Them All" [19]) at the International Conference on Automated Deduction in 2013. It is the main conference of the year in the domain of Automated Reasoning. In this talk he presented the *Why3* approach for interacting with dozens of provers on the same theories and goals. This invited talk is a recognition by the community of this unique feature of *Why3*.

- Most 18-year old French students pass an exam called Baccalaureate which ends the high school and is required for attending the university. The idea was to try our Coq library Coquelicot on the 2013 mathematics test of the scientific Baccalaureate. C. Lelay went to the "Parc de Vilgénis" high school in Massy, France and took the 2013 test at the same time as the students, but had to formally prove the answers [45] (see also https://www.lri.fr/~lelay/).

- The Coq proof assistant received the ACM *Programming Languages Software Award* in 2013 http://www.sigplan.org/Awards/Software/Main. The development of Coq was initiated by Thierry Coquand and Gérard Huet in 1984. The current environment is the result of the work of more than 40 direct contributors, including major contributions by Christine Paulin-Mohring and Jean-Christophe Filliâtre from our team.

TRIO Team

2.2. Highlights of the Year

This is the last activity report of TRIO team, as the team ends in 2013. TRIO has been, originally, created in 2002 under the guidance of Françoise Simonot-Lion. In 2010, when Françoise became director of Laboratoire Lorrain de Recherche en Informatique et ses Applications (LORIA), Nicolas Navet became the leader of the team. In 2012, when Nicolas Navet became Professor at University of Luxembourg, Liliana Cucu-Grosjean became the last leader of TRIO team. The team ends on an excellent Inria evaluation in 2012 that underlines the important contribution of its members within their scientific communities. Following the natural life process of an Inria team, the end of TRIO indicates the evolution of its members to new exciting research problems.

Liliana Cucu-Grosjean gave the keynote talk of the 21st International Conference on Real-Time Networks and Systems. Her talk concerned the probabilistic real-time systems.

Dorin Maxim and Liliana Cucu-Grosjean published a paper entitled "Response Time Analysis for Fixed-Priority Tasks with Multiple Probabilistic Parameters" at the IEEE Real-Time Systems Symposium (RTSS), the flag conference on real-time systems.

The FP7 STREP PROARTIS has been successfully completed in July 2013. TRIO was leader of the work package on the probabilistic approaches and tools within this project.

VEGAS Project-Team (section vide)

VERIDIS Project-Team

2.2. Highlights of the Year

Uwe Waldmann received a LICS Test of Time Award for the paper "Set constraints are the monadic class" published at LICS 1993 together with Leo Bachmair and Harald Ganzinger. He also won the TFA category (typed first-order logic with arithmetic) of the CADE ATP System Competition 2013 using the prover SPASS+T.

Pascal Fontaine was the main organizer and program committee chair (with Christophe Ringeissen and Renate Schmidt) of FroCos 2013 in September in Nancy.

ALEA Project-Team

2.2. Highlights of the Year

- Pierrick Legrand was finalist of the Humies award (Human-Competitive Results Produced by Genetic and Evolutionary Computation) for his work on "Evolving estimators of the pointwise Holder exponent with Genetic Programming" at Genetic and Evolutionary Computation Conference (GECCO) July 6-10, 2013 In Amsterdam. The jugging committee was:
  - Erik Goodman
  - Una-May O'Reilly
  - Wolfgang Banzhaf
  - Darrell Whitley
  - Lee Spector

  The regularity of a signal can be numerically expressed using Holder exponents, which characterize the singular structures a signal contains. In particular, within the domains of image processing and image understanding, regularity-based analysis can be used to describe local image shape and appearance. However, estimating the Holder exponent is not a trivial task, and current methods tend to be computationally slow and complex. This work presents an approach to automatically synthesize estimators of the pointwise Holder exponent for digital images. This task is formulated as an optimization problem and Genetic Programming (GP) is used to search for operators that can approximate a traditional estimator, the oscillations method. Experimental results show that GP can generate estimators that achieve a low error and a high correlation with the ground truth estimation. Furthermore, most of the GP estimators are faster than traditional approaches, in some cases their runtime is orders of magnitude smaller. This result allowed us to implement a real-time estimation of the Holder exponent on a live video signal, the first such implementation in current literature. Moreover, the evolved estimators are used to generate local descriptors of salient image regions, a task for which a stable and robust matching is achieved, comparable with state-of-the-art methods. In conclusion, the evolved estimators produced by GP could help expand the application domain of Holder regularity within the fields of image analysis and signal processing.

- The IRSES FP7 Marie Curie project ACOBSEC presented by the team ALEA was accepted.

  Over the last decade, Human-Computer Interaction (HCI) has grown and matured as a field. Gone are the days when only a mouse and keyboard could be used to interact with a computer. The most ambitious of such interfaces are Brain-Computer Interaction (BCI) systems. The goal in BCI is to allow a person to interact with an artificial system using only brain activity. The most common approach towards BCI is to analyse, categorize and interpret Electroencephalography (EEG) signals, in such a way that they alter the state of a computer. The objective of the present project is to study the development of computer systems for the automatic analysis and classification of mental states of vigilance; i.e., a person's state of alertness. Such a task is relevant to diverse domains, where a person is expected or required to be in a particular state. However, this problem is by no means a trivial one. In fact, EEG signals are known to be highly noisy, irregular and tend to vary significantly from person to person, making the development of general techniques a very difficult scientific endeavour.
  List of Beneficiaries
  - Beneficiary 1 (coordinator) Institut National de Recherche en Informatique et Automatique Inria France
  - Beneficiary 2 Universite Victor Segalen Bordeaux II UB2 France
  - Beneficiary 3 Instituto de Engenharia de Sistemas e Computadores, Investigacao e Desenvolvimento em Lisboa INESC-ID Portugal
  - Beneficiary 4 Universidad de Extremadura UNEX Spain
  - Partner 5 Instituto Tecnologico de Tijuana ITT Mexico
  - Partner 6 Centro de Investigacion Cientifica y educacion Superior de Ensenada, Baja California CICESE Mexico

APICS Project-Team (section vide)

ASPI Project-Team (section vide)

BACCHUS Team

2.2. Highlights of the Year

- In the context of the first contract supported by European Space Agency on uncertainty quantification (UQ), we applied some innovative UQ techniques in the challenging issue of predicting phenomena associated to the atmospheric reentry. In particular, we focused on the characterization of free-stream conditions in flight experiments, and the prediction of the radiative heat flux in high enthalpy facilities.

- In 2013 we have organized or contributed to the organization of three international conferences held at Inria or on the applied science campus of the Université de Bordeaux I : the Second ECCOMAS Young Investigators Conference (http://yic2013.sciencesconf.org), the EUROPEAN WORKSHOP on High Order Nonlinear Numerical Methods for Evolutionary PDEs (http://honom2013.bordeaux.inria.fr/), and the International Workshop on Uncertainty Quantification in fluids Simulation (http://boquse2013.bordeaux.inria.fr/) ;

- We have finally succeded in proposing Residual Distribution schemes that are *uniformly* accurate independently of the Reynolds number laminar, and turbulent compressible flow equations, with a stunning convergence to steady state down to machine zero ;

- We have shown the applicability of stabilized finite elements to the simulation of free surface water waves described by Boussinesq modes. We have demonstrated that residual based stabilization operators do not degrade the accuracy of the underlying finite element scheme, and used this to construct non oscillatory schemes for wave propagation, breaking, and runup ;

- We have developed an algorithm for the robust construction of curved simplicial meshes in two and three dimensions. Starting from a classical (straight) mesh, we are able to curve the boundary elements then the volumic ones and keep the boundary layer structures, even for meshes designed for turbulent simulations ;

- We developed a multiresolution strategy applied to a semi-intrusive scheme recently introduced in the context of uncertainty quantification (UQ) analysis for compressible fluids problems. This is one of the first global schemes in literature permitting an adaptive refinement in the coupled physical/stochastic space .

- `PaMPA` remeshed a coarse mesh of 27 millions of elements up to a fine mesh comprising more than 600 millions of elements, in 34 minutes, on 240 processors of the Avakas cluster at MCIA Bordeaux.

- François Pellegrini published a book on software law ; co-authored with Sébastien Canevet, associate professor at Université de Poitiers.

BIPOP Project-Team (section vide)

CAD Team (section vide)

CAGIRE Team

2.2. Highlights of the Year

AeroSol has been successufully tested on the Turing machine of the IDRIS computing center. This was a pre-requisite for the subsequent simulation of the targeted flow configuration.

CALVI Project-Team

2.2. Highlights of the Year

The Selalib project has made important progress in its development as it prepares for a release in 2014 with new additions in terms of capabilities and contributors.

CLASSIC Project-Team (section vide)

COMMANDS Project-Team

2.3. Highlights of the Year

In collaboration with L. Giraldi and M. Zopello, we started in 2013 to study the optimal swimming strategies for micro-swimmers. Our approach allows us to solve the optimal control problem without making restrictive assumptions on the shape of the swimming movements. The first numerical results on the 3-link swimmer indicate the existence of a periodic stroke with a better displacement speed than the canonical stroke presented by Purcell in 1977. Further directions include optimal design of micro-swimmers and comparing our simulations to the movement of live micro-organisms.

In collaboration with CNES, a trajectory optimization problem for Ariane 5 was studied and analyzed by HJB approach. In this study, the flight model is considered in dimension 6 without simplification. The problem consists in maximizing the payload to steer the launcher from the launch base (Kourou) to the GEO orbit. The mission includes ballistic phases and the optimization also encompasses the intermediate GTO orbit parameters. The optimization criterion is the mass of the payload to be injected on the GEO.

Finally, the team completed 3 PhD and 4 patents in 2013.

CORIDA Project-Team

2.2. Highlights of the Year

Marius Tucsnak has been nominated Senior Member of the Institut Universitaire de France.

George Weiss visited our team in the frame of the "Chercheur d'excellence" program of Région Lorraine.

CQFD Project-Team

2.2. Highlights of the Year

The paper *Optimal stopping for predictive maintenance of a structure subject to corrosion* [7] was nominated winner of the 2012 SAGE Best Paper Award by the editorial board of Journal of Risk and Reliability.

DEFI Project-Team

2.2. Highlights of the Year

G. Allaire received the 2013 Dargelos Prize of AX, the alumni association of Ecole Polytechnique.

DISCO Project-Team

2.2. Highlights of the Year

Frédéric Mazenc in June 2013 for his presentation of the paper was awarded by the *IEEE Control Systems Society* the *Best Presentation of Session Presenter*.

Sorin Olaru got the Best paper award at the 17th International Conference on System Theory, Control and Computing .

BEST PAPERS AWARDS :

[55] **ACC**. F. MAZENC, T. DINH, S.-I. NICULESCU.

[52] **ICSTCC 2013**. C. KOITI IDE, S. OLARU, P. RODRIGUEZ-AYERBE, A. RACHID.

DOLPHIN Project-Team

2.2. Highlights of the Year

BEST PAPER AWARD :

[62] **GECCO - Genetic and Evolutionary Computation Conference - 2013**. M. NOUREDINE, T. V. LUONG, B. KARIMA, T. EL-GHAZALI.

GAMMA3 Project-Team (section vide)

GECO Project-Team

2.2. Highlights of the Year

We edited two volumes on two different and challenging subjects, that is hybrid systems with constraints [12] and sub-Riemannian geometry [13].

GEOSTAT Project-Team

2.2. Highlights of the Year

- Hicham Badri, PhD student in GEOSTAT (thesis under way cosupervised by H. Yahia and D. Aboutajdine) received the University Mohammed V best Master student award.

- The paper *Reconstructing an image from its edge representation* by Suman K. Maji, H. Yahia and H. Badri [19] is ranked in the top ten entries in the list of most downloaded papers of Elsevier's Digital Signal Processing journal.

- The paper *An efficient solution to sparse linear prediction analysis of speech* by V. Khanagha and K. Daoudi [15] is ranked in the top ten entries, 13th over 100, in the list of most downloaded papers in 2013 of the EURASIP Journal on Audio, Speech, and Music Processing.

- GEOSTAT and DYNBIO (LEGOS, CNRS UMR 5566, Toulouse) teams have computed daily ocean dynamics at super resolution over a large area around the Algunas current near South Africa using low resolution altimetry data and high resolution Sea Surface Temperature (SST) data for the year 2006. The computed ocean dynamics over a one year time interval is the result of the propagation of low resolution ocean dynamics derived from altimetry across the scales of a multiresolution analysis computed on the SST singularity exponents. The resulting turbulent ocean dynamics has been made into a movie with the help of Inria DIRCOM team (C. Blonz, P.-O. Gaumin) [1].

- Researchers of GEOSTAT have been invited to two speaker sessions, firstly in one of the best international conference in computational biomedecine: EMBC 2013, [21], and second during the India-CEFIPRA workshop in ICST "Challenges in overcoming complexity, from big data to cyberphysical systems", April 4 - 5, 2013, New Delhi- India [22].

- Paper *Fast Multi-Scale Detail Decomposition via Accelerated Iterative Shrinkage* [24] accepted at SIGGRAPH ASIA 2013 conference (technical brief).

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[1] http://geostat.bordeaux.inria.fr/exj1309/annee2006_SHORTER_2ipj.mov (size $\sim$ 800 Mo).

I4S Project-Team

2.2. Highlights of the Year

- Prize Bretagne Jeune Chercheur 2013 for Michael Doehler.
- PEGASE 2 launch

IPSO Project-Team

2.3. Highlights of the Year

- A. Debussche was the main organizer of the thematic semester "Perspectives in Analysis and Probability" organized by the Lebesgue Center in Nantes and Rennes from april to september 2013 (see: http://www.lebesgue.fr/content/sem2013-perspectives-analysis-and-probability).
- E. Faou received the Blaise Pascal prize (GAMNI/SMAI and French Academy of Sciences).
- G. Vilmart defended his Habilitation to supervise research (HDR) in Mathematics, [12], July.
- G. Vilmart receives the "Prix Bretagne Jeune Chercheur 2013" from the Region Bretagne, December.

MATHRISK Project-Team

2.2. Highlights of the Year

- AA. Sulem has been invited for a Plenary talk at IFIP TC 7 Conference on System Modelling and Optimization, Klagenfurt, Austria. September 2013 - http://ifip2013.uni-klu.ac.at/

- The paper of B. Jourdain with S. Méléard and W. Woyczynski "Lévy flights in evolutionary ecology", *Journal of Mathematical Biology*, has been honored by the prize La Recherche - Mathématiques 2013 - http://www.leprixlarecherche.com/palmares-2013

Maxplus Project-Team (section vide)

MC2 Project-Team

2.2. Highlights of the Year

- In collaboration with the Bordeaux cancer therapy of Bordeaux (Bergonie) the MC2 team has developped an adaptive radiotherapy technique to follow automatically organs using the low resolution control scanners. This method is helpful in order to avoid the overdose in high risk organs. Thanks to image processing it was shown that the movement of organs is much more important than predicted before and a better control is necessary. This work continues with the design of automatic tools to follow organ movements.

- In collaboration with Rajat Mittal (John Hopkins) accurate numerical simulations were performed using the NaSCar code to improve the energetic efficiency of underwater submarine robots. As these robots are propelled in the water using fish like models, the used flippers were modified maximizing their energy and therefore minimizing their energy consumption.

- As the final step of the PREDIT Caravaje, the optimized form of an actuator was designed using adjoint methods. It should be implemented in a car body in order to reduce drag forces and consequently the fuel consumption/pollution. The results are published.

- Numerical simulations were performed to reproduce the soap bubbles experiments performed by Hamid Kellay team (Loma). Simulations are allowed by a change of metrics between a plane and an hemisphere using a stereographic projection. The results in accordance with the experiments were published in Nature scientific reports.

MCTAO Project-Team (section vide)

MICMAC Project-Team (section vide)

MISTIS Project-Team

2.2. Highlights of the Year

2.2.1. European project HUMAVIPS.

The European project HUMAVIPS – Humanoids with Auditory and Visual Abilities in Populated Spaces – is a 36-month FP7 STREP project coordinated by Radu Horaud and which started in 2010. The project addressed multimodal perception and cognitive issues associated with the computational development of a social robot. The objective was to endow humanoid robots with audiovisual (AV) abilities: exploration, recognition, and interaction, such that they exhibit adequate behavior when dealing with a group of people. Research and technological developments emphasized the role played by multimodal perception within principled models of human-robot interaction and of humanoid behavior. The HUMAVIPS project was successfully terminated in January 2013.

An article about *Integrating Smart Robots into Society* refers to HUMAVIPS. The article stresses the role of cognition in human-robot interaction and refers to HUMAVIPS as one of the FP7 projects that has paved the way towards the concept of audio-visual robotics. The article was published in HORIZON, which is Europe's Research & Innovation Magazine.

2.2.2. Best Paper Award at IEEE MMSP'13.

The paper addresses the problem of aligning visual and auditory data using a sensor that is composed of a camera-pair and a microphone-pair. The original contribution of the paper is a method for audio-visual data aligning through estimation of the 3D positions of the microphones in the visual centred coordinate frame defined by the stereo camera-pair. Please consult http://www.mmsp2013.org/mmsp2013_awards.php and .
BEST PAPERS AWARDS :
[41] **MMSP 2013 - IEEE International Workshop on Multimedia Signal Processing**. V. KHALIDOV, F. FORBES, R. HORAUD.

MODAL Project-Team
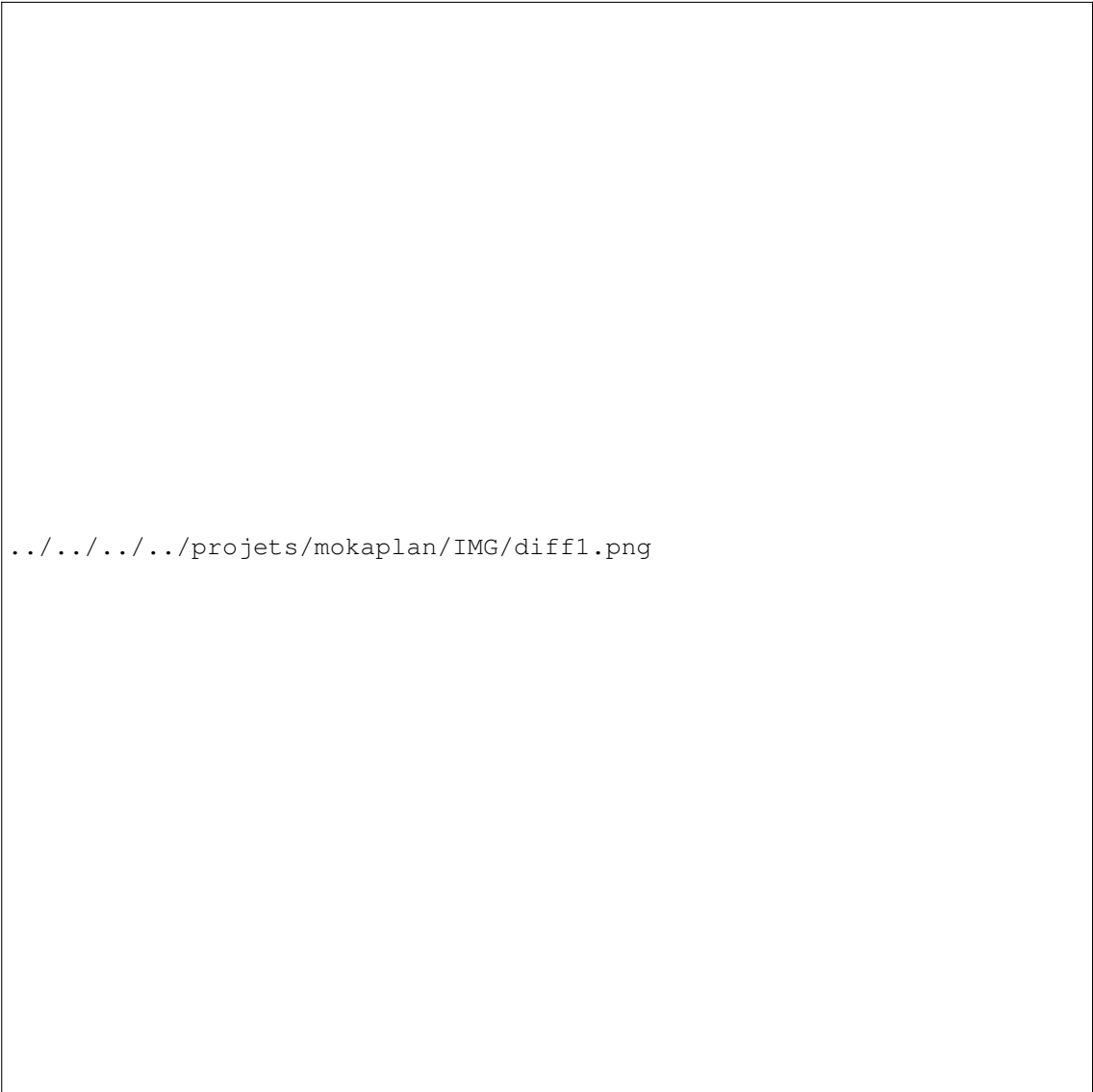
2.2. Highlights of the Year

- The team developed an extended version of the Rmixmod package allowing to cluster simultaneous mixed categorical and continuous data (see Section [Rmixmod package for mixed data]).
- The full understanding of cross-validation procedures in density estimation has been tackled with new results in terms of risk estimation and model selection (Section [Resampling procedures]).
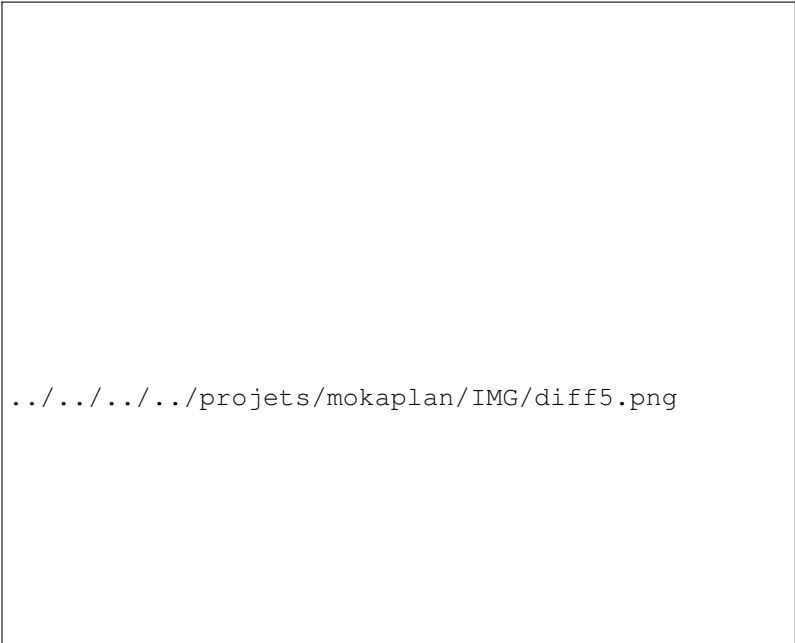
MOKAPLAN Exploratory Action

2.2. Highlights of the Year

The paper [6] resolves numerically the Monge-Ampère formulation of the Optimal Tansportation problem with quadratic cost with the correct "second boundary value" boundary conditions. It is worth pointing that this has been an open problem for a while. The same paper proposes a fast and robust Newton method (empirically linear) which can be applied to degenerate cases. This potentially means progress in many applications of Optimal Mass Transportation. The method has, for instance, been reimplemented in [72] by TU Eindhoven researchers in collaboration with Philips Lightning Labs to simulate the design of reflectors. In 2013, the method was the topic of invited presentations at the Collège de France applied math seminar, at MSRI (UC Berkeley) special program on Optimal Mass Transportation and at SIAM annual conference on PDE analysis.

../../../../projets/mokaplan/IMG/diff1.png

../../../../projets/mokaplan/IMG/diff5.png

NACHOS Project-Team (section vide)

NANO-D Team (section vide)

NECS Project-Team

2.2. Highlights of the Year

In 2013, Carlos Canudas de Wit, leader of the NECS team, has become:

- President Elect of the European Control Association EUCA (http://www.euca-control.org/);
- IEEE CSS distinguished lecturer;
- Associate Editor of IEEE Transactions on Control System Technology (since January 2013) and of IEEE Transactions on Control of Network Systems (since June 2013).

NON-A Project-Team

2.3. Highlights of the Year

- The Implicit Lyapunov Function (ILF) method for non-asymptotic (finite-time and fixed-time) stability analysis of ordinary differential equations has been developed in [75]. The new principles for design of non-asymptotic controls based on ILF are presented.

- New developments for interval estimation of time-delay systems [22], [56] and control of systems with unknown time-varying input delays based on interval predictors [34], [76].

- New results for control of linear [59] or nonlinear [73] systems using asynchronous sampling.

- New book on fault detection and isolation in aerospace systems [86].

- New application has been addressed dealing with the networked control of haptic systems.

- New concrete application of homogeneous, finite-time control, to a pneumatic actuator [36].

- A patent with Airbus has been deposed for a fault detection in actuators of an airplane [87].

OPALE Project-Team

2.3. Highlights of the Year

Opale now participates in the KIC EIT ICT Labs activity, IMS - Intelligent Mobility and Transportation Systems, "Multimodal Mobility". In this area, a new contract with Autoroute Trafic on "Design and validation of traffic flow models on processed data" has been set up.

In the area of multi-disciplinary optimization, technical collaboration with research and industrial partners (Arcelor Mittal) have been enforced and new axes (nanoelectronics with CEA/LETI Grenoble) developed.

Régis Duvigneau defended his habiltation thesis (HdR).

POEMS Project-Team (section vide)

REALOPT Project-Team

2.2. Highlights of the Year

Our scientific contributions have been recognized by prestigious journals such as Mathematical Programming, EURO Journal on Computational Optimization, INFORMS Journal on Computing, European Journal of Operational Research, Transportation Science, European Journal of Combinatorics, and Combinatorica, as well as by our participations to prime scientific meetings. In particular, François Vanderbeck was invited as a keynote speaker at the European/American Operations Research Conference in Rome (his presentation was "Extended formulations, Column Generation, and stabilization: synergies in the benefit of large scale applications" which is a subject central to our team work this year); Arnaud Pêcher was invited speaker at the International Conference in Discrete Mathematics, India.

Our methodology of combining an extended formulation approach with Dantzig-Wolfe decomposition has proved able to handle the very large scale instances of railway fret transportation applications (as shown by the very competitive results obtained by Ruslan Sadykov) as well as power production planning at EDF (Jinil Han has managed to solve the Roadef Challenge Instances in a few minutes, while Boris Detienne develops a robust approach on that basis). The Samba associated-team project with Brasil has been at the core of our methodological research effort with a one-month-visit of Professor Uchoa, and a one-year-stay of his PhD student, Hugo Kramer. New industrial collaborative project have started: working on the dimensioning of a logistic fleet with Exeo-Solution (Pierre Pesneau is leading this project), on planning operations in wineries with Ertus Consulting, and on packing and cutting problems with Renault and Saint-Gobain (Francois Clautiaux is an expert on those).

The team is very fortunate to have made very successful appointments: a university professor, Francois Clautiaux, an assistant professor, Boris Detienne and an expert engineer, Issam Tahiri, to be appointed by the center of excellence - labex CPU. Let us also mention that the team is organizing the annual conference of the French Operation Research society (ROADEF) taking place in Bordeaux in February 2014.

REGULARITY Project-Team

2.2. Highlights of the Year

J. Lévy Véhel was a finalist at the 2013 Humies competition in Amsterdam.

SCIPORT Team (section vide)

SELECT Project-Team (section vide)

SequeL Project-Team

2.2. Highlights of the Year

- In 2013, Crazy Stone won the 6th edition of the UEC Cup and the first edition of the Denseisen. Crazy Stone is a Go-playing program developed by Rémi Coulom since 2005, based on the Monte Carlo Tree Search method. The UEC Cup is the most important international computer-Go competition, organized yearly by the University of Electro-Communications in Tokyo, Japan. The Denseisen is a match between the winner of the UEC Cup and a top Japanese profesionnal Go player. This year Crazy Stone won a game with 4 stones of handicap against 9-dan profesionnal player Yoshio Ishida.

- The International Machine Learning Society selects SEQUEL to organize the 32nd International Conference on Machine Learning in 2015 at Lille. ICML is the most important conference in the field of machine learning.

SIERRA Project-Team

2.2. Highlights of the Year

- Visit of Prof. Michael Jordan (U.C. Berkeley) and of his research group.
- Recruitment of two researchers: Alexandre d'Aspremont (DR2 CNRS) and Simon Lacoste-Julien (Inria Starting researcher position).
- Start of a collaboration with Microsoft Research (within the joint MSR/Inria lab).

SIMPAF Project-Team

2.2. Highlights of the Year

A. Gloria was awarded an ERC Starting Grant.

TAO Project-Team

2.3. Highlights of the Year

2.3.1. Extensions of Multi-Armed Bandits and Monte-Carlo Tree Search

Risk Avoidance Exploration might exert a toll on the agent/system safety in real-world contexts (e.g., controlling a power system or a robot). Risk adverse criteria have been pioneered in MAB, together with multi-objective reinforcement learning – see [12] and [19].

Continuous Options The Rapid Action Value Estimate (RAVE) has been extended to continuous settings [27].

2.3.2. Information Theory and Natural Gradient

Information-geometric Optimization: convergence results. Theoretical guarantees have been obtained for continuous optimization algorithms in the framework of *information geometry* (IGO). Previous improvement guarantees for gradient descent-based methods were valid only for infinitesimally small step sizes. Information geometry and using the *natural gradient* provide improvement guarantees for finite step sizes as is the case in practice [22]. Along the same lines, geodesics in statistical manifolds have been used for estimation of distribution optimization algorithms.

Neural Network Training is a hard optimization problem, sensitive to the problem representation and the optimization trajectory. Within a Riemannian geometry framework, the use of intrinsic Riemannian gradient has been shown to support an affine transformation-invariant optimization approach, with significant robustness improvements at the same cost as the state of the art [66]. This Riemannian approach has been applied to recurrent neural nets, with very satisfactory results on difficult symbolic sequences with non-local dependencies [65]. In the related field of stacked restricted Boltzman machines, we have shown that the layer-wise approach supporting the celebrated deep learning approach yields *globally optimal* results provided the inference (as opposed to generative) model is rich enough, with quantitative estimates [60]. This result is the first of its kind on layerwise deep learning.

TOSCA Project-Team (section vide)

CORTEX Team (section vide)

ABS Project-Team (section vide)

AMIB Project-Team

2.2. Highlights of the Year

Michael Levitt, our international collaborator of the ITSNAP Associated team, was awarded the Nobel Prize in Chemistry *for the development of multiscale models for complex chemical systems*. The Nobel lecture is available at http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2013/levitt-lecture.html.
The *Best application paper* at EGC 2013 was awarded to [34].

ANGE Team

2.2. Highlights of the Year

On the one hand, the ERC Consolidator Grant allocated to Anne Mangeney will enable cross-disciplinary works for the modelling of processes governing landslides. In the same spirit, the first Albert Tarantola workshop managed by A. Mangeney and J. Sainte-Marie held on September and aimed at promoting collaborations between mathematicians and geophysicists.

On the other hand, 2013 was dedicated to "Mathematics for Planet Earth" under the patronage of UNESCO. This international initiative consisted in highlighting the role played by mathematics in the modelling of processes that occur on earth including geophysics, biology and human sciences. The ANGE team got involved into this dynamic through the ARP "MathInTerre" from the French agency for research (ANR): scientific committee, organisation of dedicated workshops,...

ARAMIS Team

2.2. Highlights of the Year

Olivier Colliot was invited to give a lecture at the National Academy of Medicine in October 2013.

Stanley Durleman was invited to give a presentation at the Rank Prize Funds symposium "Medical Imaging meets Computer Vision" in March 2013.

ASCLEPIOS Project-Team

2.2. Highlights of the Year

- Nicholas Ayache the received MICCAI 2013 "Enduring Impact Award" for his scientific contributions since the inception of the conference in 1998.

- Nicholas Ayache was elected by the Collège de France to the Chair "Informatics and Computational Sciences" for the academic year 2013-2014.

- The company Therapixel, spin-off of the Inria project teams Asclepios (Olivier Clatz) and Parietal (Pierre Fillard), received an OSEO award in the category "Creation-Development" of start-up companies.

ATHENA Project-Team

2.2. Highlights of the Year

Rachid Deriche was awarded the 2013 French Academy of Sciences Grand Prize of the EADS CORPORATE FOUNDATION in Computer Science. This award recognizes the achievement of a scientist in a French laboratory who has made exceptional contributions to the vitality and influence of computer-science research while building outstanding cooperation with industry. It has been officially awarded at the Institut de France on October 15th, 2013.

Demian Wassermann has been recruited as junior research scientist (CR2 Inria). He joined the ATHENA project-team by the end of Decembre 2013.

4 PhD students have been recruited : Brahim Belaoucha, Kai Dang, Rutger Fick and Marco Pizzolato.

2 PhD students defended their thesis at Nice Sophia Antipolis University : Sylvain Merlet (Sept. 11) and Anne-Charlotte Philippe (Dec. 19).

2 ANR projects have been accepted : ANR Mosifah and ANR Vibrations (see the dedicated part in this report).

BAMBOO Project-Team

2.1. Highlights of the Year

BAMBOO is proposing the creation of a new Inria project team, ERABLE, that would replace BAMBOO. ERABLE would be a European Inria project team gathering the current members of BAMBOO, together with four researchers in Italy under the banner of the University of Rome La Sapienza (Alberto Marchetti-Spaccamela from La Sapienza, Pierluigi Crescenzi from the University of Florence, Roberto Grossi and Nadia Pisanti from the University of Pisa), and two researchers in the Netherlands under the banner of the CWI (Leen Stougie from the Free University of Amsterdam and the CWI, Gunnar Klau from the CWI). This proposal is currently been evaluated.

BANG Project-Team

2.2. Highlights of the Year

Benoît Perthame was head of the team until January 2013 when he became head of the Laboratoire Jacques-Louis Lions of UPMC (Univ. Paris VI), a laboratory with around 200 members: University, CNRS or Inria permanent members, plus many non-permanents (PhD students, postdocs and engineers). Since then, Marie Doumic has been acting as the BANG team head and now heads the new team MAMBA.

BEAGLE Project-Team

2.2. Highlights of the Year

- The Beagle Team has been granted an FP7 project (FET Proactive "Evolving Living Technologies" call). The EvoEvo ("Evolution of Evolution") project connects five european teams working in evolutionary biology (D. Schneider, UJF, France; S. Elena, CSIC, Spain; Beagle, Inria, France), computational biology (P. Hogeweg, Utrecht University, Nederland; Beagle, Inria, France) and unconventional computing (S. Stepney, University of York, UK; Beagle, Inria, France). EvoEvo has been launched at the initiative of the Beagle Team who leads the project. Total amount funded: 2.6 Million euros. Amount funded for Inria : 800.000 euros.

- We organized the international conference "RECOMB Comparative Genomics" in October 2013, in Lyon and the international conference "Models and Algorithms for Genome Evolution" in August 2013 in Montreal, Canada. Following the latter conference, we co-edited a book published in the "Computational biology" series of Springer [37].

- Our long-lasting collaboration with the BM2A team of the CGphyMC (Centre de Génétique et de Physiologie Moléculaire et Cellulaire) is based on co-development of experimental work in the "wet lab" of the CGphyMC and computational experiments in the "dry lab" of Beagle. By using this approach to investigate the molecular basis of the stochasticity of gene expression in higher eukaryotic cells, we have been able to show that this stochasticity is due to intermittent transcription events with very long periods of quiet states. These results have been published in a high impact biological journal in February 2013 [12].

- Our work on the signalling pathways implicated in synaptic plasticity, initiated in 2012 [34] and carried out in collaboration with the experimental neurobiology lab led by L. Venance at Collège de France, Paris, became a major project for Beagle in 2013, with the recruitment of I. Prokin (PhD, Inria grant) and the extension of the collaboration to the group of A. Blackwell (Georges Mason University, USA). Respective publications and funded projects are expected for 2014.

- The project related to the study of intracellular reaction-diffusion dynamics of signalling pathways started to develop in 2013 a more mathematical direction. This is carried out with Beagle and S. Fedotov (School Mathematics, Univ. Manchester, UK), V. Calvez (Inria Numed, Lyon), T. Lepoutre (Inria Dracula, Lyon) and Master student A. Mateos-Gonzalez (ENS Lyon, Mathematics).

BIGS Project-Team (section vide)

BIOCORE Project-Team

2.2. Highlights of the Year

- Based on simple microalgae models, optimal operating conditions were theroretically identified for the biomass productivity under day/night cycles using Pontryagin's maximum principle [25]. This results paves the way for the theoretical and numerical development of (near)-optimal control laws for lipid production based on more complex models.

- The dynamical behaviour of biological networks can often be qualitatively described by piecewise affine systems. We developed a probabilistic approach for describing the trajectories and predicting periodic orbits in such models. In the state transition graph, a *transition probability* between two nodes can be defined in terms of model parameters [22]. This approach could be used for design or control of genetic networks.

BONSAI Project-Team (section vide)

CARMEN Team

2.2. Highlights of the Year

- Simon Labarthe was awarded the « prix de THESAQT », during the « Forum NOVAQT » on innovation organized by the region Aquitaine. The price was awarded for his scientific achievements during his PhD.

CASTOR Team (section vide)

CLIME Project-Team (section vide)

COFFEE Project-Team (section vide)

DEMAR Project-Team (section vide)

DRACULA Project-Team (section vide)

DYLISS Project-Team

2.2. Highlights of the Year

The collaboration with Universidad de Chile was strengthened by the organization of a workshop in Chile gathering Chilean, French and German partners about the modeling of biological systems [website], the defense of a co-supervised Ph-D thesis [13], and a graduate-level course given by a Dyliss member in Chile.

FLUMINANCE Project-Team (section vide)

GALEN Project-Team

2.2. Highlights of the Year

- **BIOMED Summer School**: Galen has organized the Biomedical Image Analysis Summer School : Modalities, Methodologies & Clinical Research at Paris between July 8th and July 12th, 2013 involving international leaders/contributors in the field of biomedical image analysis as instructors where approx 100 participants were selected from an outstanding number of applications.

- **Coursera**: Pawan Kumar Mudigonda & Nikos Paragios introduced a new course on discrete inference and learning in artificial vision on the Coursera platform with approx 15,000 student enrollments.

- **Editor in Chief**: Nikos Paragios was named editor in chief of the Computer Vision and Image Understanding Journal (CVIU). CVIU is published by Elsevier Publishing House and is one of the oldest and leading journals in the field of computer vision and image understanding. In 2009, it was named one of the top 20 journals in computer science by Times Higher Education.

GENSCALE Project-Team

2.2. Highlights of the Year

- Creation of KoriScale, an Inria Innovation Laboratory (I-LAB) to promote technology transfers between GenScale and the Korilog Company. The research thematic is focusing on intensive genomic sequence comparison. It covers innovative string algorithm aspects together with multi-level parallelism implementation. [Letter in Emergences]

- For the 2nd consecutive year the GenScale team won the best poster award from the annual Jobim conference. We demonstrate the efficiency of our low memory footprint NGS assembly tools to assemble the *C. Elegans* genome on the Raspberry Pi board, a very low cost computer (< $ 50) equipped with limited memory resources (512 MB). [42] [Letter in Emergences]

IBIS Project-Team

2.2. Highlights of the Year

A paper based on the PhD thesis of Sara Berthoumieux was accepted for *Molecular Systems Biology* this year [4] and selected as an Editor's choice in *Science* (http://ibis.inrialpes.fr/article1040.html).

The start-up company BGene, created by Johannes Geiselmann and former IBIS member Caroline Ranquet, together with Marie-Gabrielle Jouan (Floralis, Université Joseph Fourier), obtained an Emergence award in the 2013 Oséo Concours d'entreprises innovantes (http://www.grain-incubation.com/oseo-start-ups-laureates-categorie-emergence/). BGene is active in the field of DNA engineering (Section 6.2).

M3DISIM Team

2.1. Highlights of the Year

- Hiring of one new permanent researcher: Sébastien Imperiale (CR2);
- New European project named VP2HF, see 7.2.1.2 ;
- First paper with experimental validations of our cardiac model, see [13].

MAGIQUE-3D Project-Team (section vide)

MAGIQUE-3D Project-Team (section vide)

MAGNOME Project-Team (section vide)

MASAIE Project-Team

2.4. Highlights of the Year

The estimation of sequestered parasite population has been a challenge for the biologist and modeler, with many authors having studied this problem. The difficulty is that the infected erythrocyte leaves the circulating peripheral blood and binds to the endothelium in the microvasculature of various organs. A measurement of Plasmodium falciparum parasitaemia taken from a blood smear therefore samples young parasites only and there is no clinical methods to measure the sequestered parasites. We have developed a simple tool to estimate the sequestered parasites and hence the total parasite burden for *Plasmodium falciparum* malaria patients. We have also given a method to estimate a crucial parameter in the model of infection. This parameter β can be thought as the "transmission/invading" factor between merozoites and erythrocytes. This work [11] will be published in "Mathematical Biosciences and Engineering".

MNEMOSYNE Team (section vide)

<h1 style="text-align:center; color:red">MODEMIC Project-Team</h1>

2.4. Highlights of the Year

A lectures program submitted by the team and R. Arditi (AgroParis Tech) entitled "Mathematics, Computer sciences and Theoretical Ecology" has been accepted by the "Centre Interfacultaire Bernoulli" at EPFL (Lausanne, Switzerland) for a semester in 2014 (see Section 7.4.3.2).

A patent has been deposited jointly with Moise/Lemon Inria project-team concerning an algorithm for "intelligent" pumps, that provides an efficient treatment of natural water resources [69].

MOISE Project-Team

2.2. Highlights of the Year

MOISE was a main contributor of the success of the MPT2013 event in France. Maëlle Nodet and Antoine Rousseau were co-authors of a movie that was presented at the MPT launch, at UNESCO. In addition, Maëlle and Antoine strongly participated to the initiative *Un jour, une brève*[1] in which Antoine was both executive editor and webmaster. This website - dedicated to scientific outreach - was visited by more than 1000 unique visitors each and every day of 2013. On the research side of MPT2013, several team members were in the main board of *Maths In Terre*[2]

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[1] See http://mpt2013.fr

[2] A French national program that was built to propose ANR a national strategy regarding applied mathematics and environmental sciences, see http://mathsinterre.fr.

MORPHEME Project-Team

2.2. Highlights of the Year

- Laure Blanc Féraud has obtained the "prix Montbonnot Inria" from the Academy of Science.

NEUROMATHCOMP Project-Team

2.2. Highlights of the Year

Our PhD student H. Nasser has obtained an award and some financial support from Nice University to create a start up to develop a software (DataSpot) based on the methods developed in Enas.

NEUROSYS Team

2.2. Highlights of the Year

In the last years we have been working on models of anaesthetic action on neural populations based on published experiments of other research groups. This year we have been able to participate in the analysis of experimental animal data measured under anaesthesia by the University of North Carolina-Chape Hill [9]. The corresponding common publication with this experimental laboratory is a perfect basis for a future international cooperation.

NUMED Project-Team (section vide)

PARIETAL Project-Team

2.1. Highlights of the Year

- The **Therapixel** start-up was created by Pierre Fillard (effective on July 1st, 2013) http://www.therapixel.com/company/. Therapixel is designing a device to look at and interact with images without any contact to a screen or a keyboard. This technical solution is very handy for surgeons who have to avoid any contact while in the operating room, and yet need pre-operative images. The technologies developed at Therapixel are based on those of the medInria software. Therapixel got an OSEO 2013 grant.

- The **Human Brain Project** European flagship project has been accepted in 2013 for a ten years duration (see section 7.3.1). Parietal is part of it and took part to the kick-off in October 2013.

POMDAPI Project-Team (section vide)

Popix Team

2.2. Highlights of the Year

The Inria Innovation Lab *Lollipox* was created. This i-Lab brings together POPIX and the start-up Lixoft. It aims to boost the transfer of new statistical methods developed by POPIX to new tools developed by Lixoft.

We have built a comprehensive online wiki (WikiPopix, https://wiki.inria.fr/popix) for the population approach with mixed-effects models. This wiki aims to be an invaluable resource for all pharmacometricians, statisticians, teachers, graduate and undergraduate students in academia, industry and regulatory agencies. It is freely available online for all these communities.

Bertrand Maury published the book, *The Respiratory System in Equations* (Springer), which gives an introduction to the mathematical modeling of the respiratory system. The book starts with detailed introduction to physiological aspects, and then different levels of description are proposed, from lumped models with a small number of parameters (ordinary differential equations), up to infinite dimensional models based on partial differential equations.

REO Project-Team

2.2. Highlights of the Year

- Cristóbal Bertoglio was awarded
    - the best thesis Gamni prize by SMAI.
    - the "Best Thesis in Mathematics and their interactions" prize by the EADS/Airbus Foundation

    for his PhD thesis entitled "Direct and inverse problems in fluid-structure interaction. Application to hemodynamics", under the supervision of Jean-Frédéric Gerbeau and Miguel Àngel Fernández Varela.

- Justine Fouchet-Incaux, supervised by Céline Grandmont and Bertrand Maury, was awarded the best poster prize by the Société de Physiologie at the 8th congress of "Physiologie, Pharmacologie et Thérapeutique", Anger 2013.

SAGE Project-Team

2.2. Highlights of the Year

Year 2013 was declared Mathematics of the Planet Earth by UNESCO. In relation with this domain, the team Sage participated in the prospective think tank "MATHématiqueS en INteractions pour la TERRE" (ANR project) and in various popularization actions:

- the french blog "un jour une brève". See http://mpt2013.fr/.
- the TDC journal "les mathématiques de la terre" (no 1062, october 2013),
- papers on the website Interstices. See http://www.interstices.info.
- panels and conferences for scholars.

SERPICO Project-Team

2.6. Highlights of the Year

- Serpico is an Inria Team-Project from July 2013.

- New computing (7 nodes with 2 CPU x 8 cores, 64 GigaBytes and 128 GigaBytes of RAM including in the IGRIDA computing grid) and storage (207 TeraBytes controlled by a server with 2 CPU x 6 cores, 32 GigaBytes of RAM) facilities dedicated to calculations and algorithm runs.

- Finalist for Best Student Paper Award [16]: D. Fortun et al. Aggregation of patch-based estimations for illumination-invariant optical flow in live cell imaging. IEEE Int. Symp. Biomedical Imaging (ISBI'13), San-Francisco CA, April 2013.

SHACRA Project-Team

2.3. Highlights of the Year

2.3.1. Scientific exhibition for the french government

The intergovernmental seminar on digital sciences was held in february at the University of Cergy-Pontoise. Within this context, the team has exhibited a demonstration of a cataract surgery simulator which is dedicated to train surgeons to a new cost-effective cataract surgery procedure MSICS (*manual small incision cataract surgery*). This simulator was developed at Inria and has been transferred to the start-up InSimo.

../../../../projets/shacra/IMG/IMG_4902_web.jpg ./projets/shacra/IMG/IMG_4945_web.j

Figure 2. Demonstration of a cataract surgery simulator during the intergovernmental seminar on digital sciences.

2.3.2. Best Papers

We received the runner-up best paper award for the paper published in ISMAR 2013, the leading conference in Augmented and Mixed Reality.

BEST PAPERS AWARDS :

[22] **ISMAR - IEEE International Symposium on Mixed and Augmented Reality 2013**. N. HAOUCHINE, J. DEQUIDT, I. PETERLIK, E. KERRIEN, M.-O. BERGER, S. COTIN.

SISYPHE Project-Team

2.2. Highlights of the Year

Results in control of quantum systems obtained by Mazyar Mirrahimi and his former PhD student Zaki Leghtas in close collaboration with the teams of Michel Devoret and Robert Schoelkopf (Department of Applied Physics of Yale University) have been published in *Nature* ([49], [57]) ; *Science* ([47], [60]) ; *Physical Review Letters* ([46], [53]).

STEEP Team (section vide)

VIRTUAL PLANTS Project-Team

2.2. Highlights of the Year

- Participation to the Functional-Structural Plant Model (FSPM) international conference. The FSPM conference is an important event for the plant modeling community. At this occasion, the team made several oral presentations:
    - reconstruction methods of branching systems and foliage from laser scanner data [30], [29], or of root systems from images [33]),
    - analysis methods for Mango tree phenology [32], ramification of apple trees [40], [34] or environmental effect on growth of forest trees[38])
    - simulation (disease propagation on crops [36], [35] or fruit physiology [31]).
- Publication of a joint work with RDP at ENS-Lyon in the journal 'Nature'. In December 2013, a joint work on phyllotaxy with the RDP lab from ENS-Lyon was published online in the journal Nature [13]. Based on the analysis of phyllotaxis perturbations in mutants, this study sheds a new light on our interpretation of phyllotaxis, revisiting the standard model and suggesting that several fields based on auxin and cytokinin with different properties are required to provide robustness to phyllotaxis.

VISAGES Project-Team

2.2. Highlights of the Year

- The VISAGES team was awarded by the Brittany INPI Trophee for research and innovation in the *research structure* category (http://www.bretagne-innovation.tm.fr/Temoignages/Laureats-Trophees-INPI-Bretagne-2013-Laboratoire-VisAGeS-Video).

- H. Raoult received a Magna Cum Laude Merit Award at the 21th Annual ISMRM 2013

ACES Project-Team (section vide)

ADAM Project-Team

2.2. Highlights of the Year

Romain Rouvoy received the Best Paper Award on distributed systems of the 28th Symposium On Applied Computing (SAC) for the paper *Improving Context Interpretation by Using Fuzzy Policies: The Case of Adaptive Video Streaming* written in collaboration with Lucas Provensi, Frank Eliassen, and Roman Vitenberg from the University of Oslo (Norway) within the context of the *Sensor-as-a-Service* (SEAS) associate team. Furthermore, Romain Rouvoy has been invited as a keynote speaker of the French conference on software architectures (CAL - *Conférence sur les Architectures Logicielles*) to report on the contributions of the SEAS associate team in the area of designing distributed software architectures for sensor-based systems.

The APISENSE[®] crowd-sensing platform developed by the project-team has been awarded a research grant by the Microsoft Azure for Research program to work on the elastic processing of crowd-based datasets. This grant intends to leverage APISENSE[®] to support the real-time processing of big datasets collected in the physical world by a large crowd of smartphones. Examples of case studies covered in this area include the automatic inference of roadmaps, the continuous cartography of network coverage quality, or even the detection and the dynamic analysis of earthquakes. In particular, the unpredictable volume of data to be collected in the wild requires the adoption of elastic computation models and infrastructures to continuously provision the processing capabilities to fit uploads of information reports.

Gabriel Tamura has won the 2013 PRES Université Lille Nord de France International PhD Award for his PhD dissertation [85] on the reliable preservation of quality of service (QoS) contracts in self-adaptive distributed systems. The contribution is twofold. The first one is a model for component-based software systems where reconfiguration rules are viewed as typed attributed graphs [64] and where QoS-contracts are viewed as state machines in which transitions correspond to software reconfigurations. The second contribution is the characterization of adaptation properties to evaluate self-adaptive software systems in a standardized and comparable way. This work led to the development of the QOS-CARE framework that was the topic of several major publications [42], [43], [86], [84] in addition to the thesis dissertation itself.

BEST PAPERS AWARDS :

[36] **28th ACM Symposium on Applied Computing (SAC) - 8th Track on Dependable and Adaptive Distributed Systems (DADS)**. L. PROVENSI, F. ELIASSEN, R. VITENBERG, R. ROUVOY.

ALGORILLE Project-Team (section vide)

ALPINES Team

2.2. Highlights of the Year

- Frédéric Hecht was awarded the EADS Foundation's annual prize for Information Science and its Applications, attributed by the French Academy of Science.

- Best paper finalist at IEEE/ACM Supercomputing 2013 conference, P. Jolivet, F. Hecht, F. Nataf, C. Prud'homme, *Scalable Domain Decomposition Preconditioners For Heterogeneous Elliptic Problems*.

- Best student paper finalist at IEEE/ACM Supercomputing 2013 conference, L. Qu, L. Grigori, F. Nataf, *Parallel Design and Performance of Nested Filtering Factorization Preconditioner*.

ARLES Project-Team

2.2. Highlights of the Year

This year has seen the following acknowledgments of the team's contributions:

PRIZES:

- Valérie Issarny was awarded one of the twelve "Etoiles de l'Europe" for the year 2013. The prize rewards French teams that coordinate European projects as part of the research and innovation framework program, which Valérie received for the FP7 ICT FET CONNECT (Emergent Connectors for Eternal Software-intensive Networked Systems – https://www.connect-forever.eu/) project that examined issues facing the Future Internet.

- Animesh Pathak, Sara Hachem, Giorgios Mathioudakis, and George Rosca were awarded the Best Mashup prize of the OpenDataLab organized by RATP, for their "neverBLate" app.

BEST PAPERS AWARDS :
[12] **REFSQ 2013 - 9th International Working Conference on Requirements Engineering: Foundation for Software Quality**. N. BENCOMO, A. BELAGGOUN.

ASAP Project-Team

2.3. Highlights of the Year

- Google Focused Award (only 2 in Europe this year).
- ERC Proof of Concept Grant AllYours (2013)
- New associate team with the University of Calgary, Canada (RADCON).
- Michel Raynal published two new books on Concurrent Programming and Distributed Algorithms.
- Anne-Marie Kermarrec was elected the Vice Chair of *ACM Eurosys (ACM European Chapter of SIGOPS)*.
- Anne-Marie Kermarrec is a member of *Academia Europea* since Sept 2013.
- Michel Raynal has been nominated adjunct professor of University of Hong Kong.

ASCOLA Project-Team

2.2. Highlights of the Year

This year we have published two groups of major results. In the domain of efficient resource management in the Cloud, we have proposed an elastic consolidation service, new techniques for enforcing SLA guarantees, and new simulation methods for Cloud environments. These results have all been published in major conferences of the domain: IEEE Cloud, IEEE/ACM CCGrid and IEEE CloudCom, see Sec. 6.3 for more information.

The team has also presented several major results on the foundations of software composition. These include new programming language mechanisms for the correct definition of aspects and techniques for their semantic, in particular type-based, definition. These results have also been published through major dissemination channels: Elsevier's journal Science of Computer Programming and the international conference Modularity.aosd, see Sec. 6.2 for more information.

Moreover, Ismael Figueroa Palet, a PhD student co-supervised by Nicolas Tabareau and Prof. Éric Tanter from University of Chile, has finished first place at the ACM Student Research Competition at Modularity:aosd'13 with the work "Taming Aspects with Monads and Membranes."

Finally, Adrien Lèbre has been appointed in September on an Inria research position for three years.

ATLANMOD Project-Team

2.3. Highlights of the Year

Two new European projects to support new research directions for the team.

AtlanMod becomes an official Inria team.

AVALON Team (section vide)

CEPAGE Project-Team (section vide)

CIDRE Project-Team

2.2. Highlights of the Year

As highlights of the year, we wish to mention four best paper awards.

Mounir Assaf PhD thesis focusses on the verification of security properties in C programs. While investigating the domain, Mounir Assaf has created a static analysis for programs written in an imperative language with pointer aliases whose objective is to verify a property called Terminating-Insensitive Non Interference (TINI). Briefly speaking, this property guarantees that the content of secret variables of a program do not leak into public ones. Hence, this property is of paramount importance for the security of some critical software components. This work has conducted to the publication of two articles. The first one appeared in (IFIP SEC 2013, a renowned international conference in the domain of security), while the second one has been published in [45] (SAR-SSI 2013), a national conference dedicated to the spreading of work in progress to the French speaking security community. Both papers received the best paper award.

Stephane Geller has proposed a language (namely BSPL) for specifying and composing information flow policies. Such policies detail how a piece of data owned by an application is allowed to disseminate in an operating system. Thomas Saliou, Radoniaina Andriatsimandefitra and Valerie Viet Triem Tong have experimented the relevance of this language. They have proposed a semi-automatic way to compute such policies. They have also show that when such policies are enforced it is possible to detect if an application is infected by a malware. This work has led to the publication of an article in an international conference of the security domain . This article received the best student paper award of the conference.

In , we propose an inference attack called the de-anonymization attack, by which an adversary tries to infer the identity of a particular individual behind a set of mobility traces. The implementation of this attack is based on a mobility model called Mobility Markov Chain (MMC), which is built out from the mobility traces observed during the training phase and is used to perform the attack during the testing phase. Experiments led on real datasets demonstrate that the attack is both accurate and resilient to sanitization mechanisms such as downsampling. This paper has received the IEEE best student paper award at the conference TrustCom 2013.
BEST PAPERS AWARDS :

[27] **SEC**. M. ASSAF, J. SIGNOLES, F. TRONEL, E. TOTEL.

[25] **IAS - Information assurance and security - 2013**. R. ANDRIATSIMANDEFITRA, T. SALIOU, V. VIET TRIEM TONG.

[31] **The 12th IEEE International Conference on Trust, Security and Privacy in Computing and Communications (IEEE TrustCom-13)**. S. GAMBS, M.-O. KILLIJIAN, M. NUNEZ DEL PRADO CORTEZ.

COATI Project-Team (section vide)

DANTE Team

2.2. Highlights of the Year

2.2.1. *Model for Time-Varying Graphs.*

We propose a novel model for representing finite discrete Time-Varying Graphs (TVGs). The major application of such a model is for the modelling and representation of dynamic networks. In our proposed model, an edge is able to connect a node u at a given time instant t_a to any other node v (u possibly equal to v) at any other time instant t_b (t_a possibly equal to t_b), leading to the concept that such an edge can be represented by an ordered quadruple of the form (u, t_a, v, t_b). Building upon this basic concept, our proposed model defines a TVG as an object $H = (V, E, T)$, where V is the set of nodes, $E \subseteq V \times T \times V \times T$ is the set of edges, and T is the finite set of time instants on which the TVG is defined. We show how key concepts, such as degree, path, and connectivity, are handled in our model. We also analyse the data structures used for the representation of dynamic networks built following our proposed model and demonstrate that, for most practical cases, the asymptotic memory complexity of our TVG representation model is determined by the cardinality of the set of edges. (See [20])

2.2.2. *Tight bounds on the contiguity and linearity of co-graphs.*

We show that the contiguity and linearity of co-graphs on n vertices are both O(log n). Moreover, we show that this bound is tight for contiguity as there exists a family of cographs on n vertices whose contiguity is Omega(log n). We also provide an Omega(log n / log log n) lower bound on the maximum linearity of co-graphs on n vertices. As a by-product of our proofs, we obtain a min-max theorem, which is worth of interest in itself, stating equality between the rank of a tree and the minimum height of one of its path partitions. (See [3])

2.2.3. *Function analysis through wavelets on dynamic contact graphs.*

Parameters of the diffusion and of the mutations of nosocomial bacteria strains are still today not completely understood. The macroscopic mechanisms involved during the diffusion are opposed to microscopic mechanisms which are well known and understood. At the scale of an hospital, this is a complex system that needs to be be simplified and modelled before an epidemiological study of the whole system. We aim at giving an answer to the question of whether there exists a correlation between the contact graph (dynamic network) and the microbiological diffusion of the strains of Staphylococcus Aureus bacteria. For that purpose, the research project MOSAR (Mastering hOSpital Antimicrobial Resistance) and the i-Bird group (Individual Based Investigation of Resistance Dissemination) designed a large scale experiment that has been carried out at the Hospital of Berck-sur-Mer (FRANCE). Our work focuses on comparing the diffusion of some selected strains to the results obtained with wavelets on the aggregated contact graph, the selection being made such as the strains show a clear diffusion over time. We study the correlation between the spatial diffusion of the wavelets and the spatio-temporal diffusion of those strains.

2.2.4. *Hierarchical Modelling of IEEE 802.11 Multi-hop Wireless Networks.*

IEEE 802.11 is implemented in many wireless networks, including multi-hop networks where communications between nodes are conveyed along a chain. We present a modelling framework to evaluate the performance of flows conveyed through such a chain. Our framework is based on a hierarchical modelling composed of two levels. The lower level is dedicated to the modelling of each node, while the upper level matches the actual topology of the chain. Our approach can handle different topologies, takes into account Bit Error Rate and can be applied to multi-hop flows with rates ranging from light to heavy workloads. We assess the ability of our model to evaluate loss rate, throughput, and end-to-end delay experienced by flows on a simple scenario, where the number of nodes is limited to three. Numerical results show that our model accurately approximates the performance of flows with a relative error typically less than 10%.

2.2.5. Awards and honours

Hurst Exponent IntraPartum Fetal Heart Rate: Impact of Decelerations [7] was granted the best paper award in the 26th IEEE International Symposium on Computer-Based Medical Systems (CBMS).

BEST PAPERS AWARDS :

[7] **IEEE 26th International Symposium on Computer-Based Medical Systems (CBMS), 2013**. P. ABRY, S. ROUX, V. CHUDÁČEK, P. BORGNAT, P. GONÇALVES, M. DORET.

DIANA Team

2.2. Highlights of the Year

Our paper , got the Best Paper Award at the ns-3 Workshop (WNS3) at SimuTools, March 2013, Workshop ns-3, Cannes, France.

BEST PAPERS AWARDS :

[26] **Workshop on NS3 (WNS3)**. H. TAZAKI, F. URBANI, T. TURLETTI.

DIONYSOS Project-Team

2.2. Highlights of the Year

This year three books produced by the team appeared: "Markov Chains. Theory, Algorithms and Applications" at Wiley, written by Bruno Sericola first in English, then in French, and "Telecommunication Network Economics: From Theory to Applications", written by Bruno Tuffin with Patrick Maillé, at Cambridge University Press.

DYOGENE Project-Team (section vide)

FOCUS Project-Team

2.2. Highlights of the Year

- Jacopo Mauro's PhD thesis "Constraints Meet Concurrency" has won the 2013 award for Best Italian PhD Theses in Theoretical Computer Science (track Logics, Semantics and Programming Theory). The prize is awarded by the Italian Chapter of EATCS.

- Davide Sangiorgi has received the "LICS Test-of-Time" award (this award recognizes a paper from the proceedings of the conference "Logics in Computer Science" from 20 years prior that has best met the "test of time" in term of impact).

- the EU project Envisage (FP7), on the theme of cloud computing, has been approved and has started its activities.

FUN Project-Team

2.2. Highlights of the Year

CENTR R&D award 2013 have been attributed on October 2nd at CENTR GA meeting. The ANR VERSO WINGS in which the FUN research group is partner has been awarded among 45 nominees. There were 4 categories (Security, R&D, Marketing and Communication, Contributor of the Year), 5 projects have been awarded in each category.

GANG Project-Team (section vide)

GRAND-LARGE Project-Team (section vide)

HIEPACS Project-Team

2.2. Highlights of the Year

The `PaStiX` solver is now able to handle efficiently multiple GPU accelerators using runtime systems (`StarPU` or `PaRSEC`). On the Plafrim machine, one GPU card can provide almost the same performance than 12 cores and we get a good scalability while mixing multicores and upto 3 GPUs accelerators.

The first implementation of the Fast Multipole method over a runtime system has been developed in the context of the FASTLA associated team. The main outcome of this work will be published in a paper to appear in the SIAM SISC journal.

HIPERCOM2 Team

2.2. Highlights of the Year

- **PhD Thesis**: Ichrak Amdouni got her PhD Thesis, entitled "Wireless Self-adaptive Ad hoc and Sensor Networks: Energy Efficiency and Spatial Reuse", University Pierre et Marie Curie - Paris VI, February 2013, with Pascale Minet as adviser and Cedric Adjih.

- **PEMWN 2013**: The HIPERCOM2 team actively contributed to the technical and practical organization of the PEMWN 2013 workshop, Performance Evaluation and Modeling of Wireless Networks, held in Hammamet in November 2013. Pascale Minet and Leila Saidane from ENSI (Tunis) were co-general chairs. Cedric Adjih and Paul Muhlethaler were members of the program committee. Christine Anocq was in charge of the pre-registration.

- **Demonstration of OCARI**: The HIPERCOM2 team and more precisely, Cedric Adjih, Ichrak Amdouni, Ines Khoufi, Pascale Minet and Ridha Soua made presentations and demonstrations of the routing protocol and the coloring algorithm of OCARI, an energy-efficient wireless sensor network supporting determinism.

KERDATA Project-Team

2.2. Highlights of the Year

Team: Shadi Ibrahim, a former Post-Doc fellow at the KerData project-team, has been hired as a permanent Junior Researcher at Inria (CR2) starting in October 2013.

A-Brain MSR-Inria project: The TomusBlobs data-storage layer developed in the framework of the A-Brain MSR-Inria project was demonstrated to scale up to 1000 cores on 3 Azure data centers; it exhibits improvements in execution time up to 50 % compared to standard solutions based on Azure BLOB storage. Based on this storage infrastructure, the A-Brain project has provided the first statistical evidence of the heritability of functional signals in a failed stop task in basal ganglia, using a ridge regression approach, while relying on the Azure cloud to address the computational burden.

Joint Lab for Petascale Computing: The Damaris middleware for I/O and in-situ visualization, initiated in 2010 in the framework of the Joint Laboratory for Petascale Computing, was ported to NCSA's Blue Waters supercomputer and provided in-situ visualization capabilities to the CM1 atmospheric simulation on up to 6400 cores.

LOGNET Team

2.2. Highlights of the Year

- The contrat Alcotra Interreg *myMed: a peer-to-peer programmable social network and cloud platform* 2010-2013 ends. LogNet was the head of this ambitious project. The project can be visited at the page http://www.mymed.fr Please have a try, see Fig 2 !

../../../../projets/lognet/IMG/splash1.png

../../../../projets/lognet/IMG/splash2.pn

Figure 2. http://www.mymed.fr

- Four articles on myMed has been published in the newspaper "Nice Matin"
    - http://www.nicematin.com/article/lapplication-myriviera-lancement-en-fevrier.689848.html
    - http://www.nicematin.com/papier/tout-sur-la-riviera%E2%80%A6-a-portee-de-doigt.831703.html
    - http://www.nicematin.com/derniere-minute/myriviera-bientot-sur-les-smartphones.831394.html
    - See Fig 3 .
- A quite nice "artistic video" on myMed can be seen on www-sop.inria.fr/teams/lognet/multimedia/myMed_v3.mov. Please enjoy it!

```
../../../../projets/lognet/IMG/nice-matin4.png
```

Figure 3. Nice Matin

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

2.2. Highlights of the Year

The following points of 2013 deserves to be highlighted:

- Two new permanent members joined the MADYNES team: Bernardetta Addis and Thibault Cholez. They are associate professor at the University of Lorraine with teaching activities at Mines Nancy and TELECOM Nancy, respectively.

- An outstanding publication was achieved in the journal "IEEE Communications Surveys and Tutorials" which has an impact factor of 4.8.

- In relation with research (Aetournos project, R2D2 ADT), the Alérion project has been one of the "15ème concours national de création d'entreprises innovantes" (national innovative startup program) prize-winner in 2013 in the "emerging" category. The Alérion project is offering an e-falconry solution based on interconnected cyber-physical bricks which will allow for the design of advanced and innovative services, and other serious games. Increasingly autonomous vehicles (UAV, UGV ...) and systems are becoming part of our daily world and can offer novel civilian applications (gaming "drones", aerial photography, vacuum cleaners ...).

- To foster the new application domain developed by the team on Software Defined Networking, the team co-organized the SDN Days (GdR CNRS RESCOM) in Loria (Nancy)

MAESTRO Project-Team

2.2. Highlights of the Year

The book by K. Avrachenkov, J. Filar and P. Howlett, "Analytic Perturbation Theory and Its Applications" [68] has been completed and published in December 2013. The book provides a unifying treatment of analytic perturbations with particular emphasis on singular perturbations. The applications considered in the book include: linear and non-linear optimization, Markov chains, Markov Decision Processes.

G. Neglia got the one-minute madness award at the conference IFIP 12th Intl. Conference on Networking (IFIP Networking 2013), for his one-minute presentation of the paper [49].

BEST PAPERS AWARDS :

[58] **ACM PM2HW2N - 8th Workshop on Performance Monitoring and Measurement of Heterogeneous Wireless and Wired Networks**. K. IBRAHIMI, E. ALTMAN, M. HADDAD.

[60] **IEEE VTC - 77th Vehicular Technology Conference**. G. NEGLIA, X. ZHANG, J. KUROSE, D. TOWSLEY, H. WANG.

MESCAL Project-Team (section vide)

MOAIS Project-Team

2.2. Highlights of the Year

- Best Paper - HeteroPar 2013
- Best Long Paper - Second Prize at Web3D 2013

BEST PAPERS AWARDS :

[23] **Proceedings of the 11th HeteroPar workshop (Algorithms, Models and Tools for Parallel Computing and Heterogeneous Platforms)**. S. KEDAD-SIDHOUM, F. MONNA, G. MOUNIÉ, D. TRYSTRAM.

[17] **18th International Conference on 3D Web**. T. FRANKE, V. SETTGAS, J. BEHR, B. RAFFIN.

MYRIADS Project-Team

2.5. Highlights of the Year

- Eugen Feller has been awarded the second PhD prize of the MATISSE doctoral school by the Fondation Rennes 1 in March 2013 for his thesis entitled *Autonomic and Energy-Efficient Management of Large-Scale Virtualized Data Centers* [53] defended in December 2012 under the supervision of Christine Morin.

- Matthieu Simonin, Eugen Feller, Yvon Jégou, David Margery, Christine Morin and Anne-Cécile Orgerie have been awarded the second prize at the Scale Challenge organized with the ACM/IEEE CC-Grid 2013 conference held in Delft, the Netherlands in May 2013. They demonstrated the scalability and resilience of Snooze IaaS management system [26], developed as part of Eugen Feller's PhD thesis and that has been supported by an Inria technology development action since October 2012.

- The paper entitled *Resilin: Elastic MapReduce over Multiple Clouds* presented by Ancuta Iordache was amongst the three best paper finalists at the CCGRID'2013 conference [31].

OASIS Project-Team

2.2. Highlights of the Year

Oasis, together with the Coati team, have signed in Dec. 2013 an industrial grant with the Amadeus company, about distributed algorithms for searching paths in very large graphs.

Oasis started in Sep. 2013 the FP7 project DC4Cities. This will promote the data centres role as an "eco-friendly" through the usage of renewable energies. Accordingly, Oasis will propose innovative scheduling techniques to match such a powering method.

PHOENIX Project-Team

2.2. Highlights of the Year

- Charles Consel was on sabbatical in Montreal at McGill Unversity for the academic year of 2012-2013. This sabbatical year has allowed us to strenghten our academic collaborations in the domain of assistive technology (e.g., Institut universitaire de gériatrie de Montréal, Université du Québec à Trois-Rivières).

- iQSpot, our technology-transfer project, has been rewarded by OSEO (15e édition du Concours national d'aide à la création d'entreprises de technologies innovantes, catégorie "En émergence") and accepted to the startup incubation program of the IRA (Incubateur Régional d'Aquitaine).

- David Daney, a researcher in Robotics, left the COPRIN project-team of CRI Sophia Antipolis-Méditerranée to join the PHOENIX project-team in September 2013. He will be investigating research topics such as system design, sensor deployment and data analysis.

RAP Project-Team (section vide)

REGAL Project-Team

2.2. Highlights of the Year

- Suman Saha received the William C. Carter Award from DSN 2013 . The award recognizes an outstanding paper based on a graduate dissertation, and is the only form of best paper award given at DSN. The award was given for the paper Hector: Detecting Resource-Release Omission Faults in Error-Handling Code for Systems Software.

- Nicolas Geoffray received the 2nd prize for the best PhD thesis in Operating System, from the French Chapter of ACM SIGOPS for his thesis titled "Fostering Systems Research with Managed Runtimes".

- Inria is the leader of the new European project SyncFree, started in October 2013, described in more detail in Section 7.2.1.1 . SyncFree is based on the CRDT (see Section 5.3.5) and SwiftCloud (Section 4.2) technologies, invented here. CRDTs are data types that are guaranteed to ensure eventual consistency by construction. SwiftCloud is a distributed store that leverages CRDTs to support fast and reliable updates to shared data. This European project, which involves several internet start-ups and academic partners, aims to develop cloud-scale applications that are simpler, more scalable and cheaper.

BEST PAPERS AWARDS :

[44] **DSN 2013 - 43rd Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DSN)**. S. SAHA, J.-P. LOZI, G. THOMAS, J. LAWALL, G. MULLER.

RMOD Project-Team

2.4. Highlights of the Year

- Stéphane Ducasse got promoted DR1 (December 2012).
- A *Web with Pharo* Conference was held 6 June 2013 @ Euratechnologies, Lille
- Pharo 2.0 (our open-source language and environment) was released. (http://www.pharo.org)
- Three releases of Moose: 4.7, 4.8 and 4.9. Moose is our open-source reengineering platform. (http://www.moosetechnology.org)
- The second PharoConf was held at University of Bern, Switzerland April 2-4.
- The first ever Pharo Tutorial at ECOOP in 2013.
- RMoD helped to Organize the Dyla workshop at ECOOP 2013.
- Creation of Synectique. The company is a spin-off based on the research done in RMoD. Synectique is selling software maintenance solutions based on Pharo. (http://www.synectique.eu)
- RMoD participated to the organization of the ESUG conference in Annecy, France in September (over 100 participants).
- *Deep into Pharo* Book Released. *Deep into Pharo* is the second volume of a series of books covering Pharo. (http://rmod.lille.inria.fr/deepIntoPharo/)
- Organization of the MooseDay in Lille on the 19th December with around 25 persons from all around the world.

ROMA Team

2.2. Highlights of the Year

Anne Benoit, Yves Robert and Frédéric Vivien published a textbook entitled "A Guide to Algorithm Design: Paradigms, Methods, and Complexity Analysis" [40].

RUNTIME Project-Team

2.2. Highlights of the Year

- The hwloc software 5.2 is used for node topology discovery and process binding by the most popular MPI implementations, including MPICH2 and OPEN MPI and all their derivatives such as Intel MPI.

- The StarPU software 5.6 is used for dynamic scheduling by EADS for his hmatrix solver.

SCORE Team (section vide)

SOCRATE Project-Team

2.4. Highlights of the Year

2.4.1. FIT/CortexLab first on-line demonstration

FIT(Future Internet of Things) is a french Equipex (Équipement d'excellence) which aims to develop an experimental facility, a federated and competitive infrastructure with international visibility and a broad panel of customers. FIT will be composed of four main parts: a Network Operations Center (NOC), a set of Embedded Communicating Object (ECO) testbeds, a set of wireless OneLab testbeds, and a cognitive radio testbed (CorteXlab) deployed by the Socrate team in the Citi lab. In 2013 the construction of the room was finished see Figure 3 . SDR nodes have been bought after setting two call for tenders, 42 industrial PCs (Aplus Nuvo-3000E/P), 22 NI radio boards (USRP) and 18 Nutaq boards (PicoSDR, 2x2 and 4X4) will now be installed in the room. A first version of the software infrastructure has been deployed and small experimentations (involving 2 USRP nodes) have been made from various places (from Brasil, United States, Villeurbanne).

2.4.2. Socrate at Paris-Tours cycling race

France Télévisions, Euro Media France and Amaury Sport Organisation have partnered again to deliver the Paris-Tours cycling race, using a wireless sensor solution to geolocate riders in realtime. These sensors where deployed in a collaboration with HikoB (Inria/Citi-lab start-up) and Socrate who provided the distributed cyclocalisation algorithm

In what was claimed as a world first, Euro Media France equipped the 200 competitors with special HikoB sensors at the beginning of the Paris-Tours race in Authon-de-Perche. This enabled to pinpoint the exact position of every rider and feed the information in real-time.

This collaboration is now held in a FUI project called Smacs. Next demostration should occur in the tour de France in 2014 targeting full deployment at the Olympic Games of 2016 in Rio de Janeiro.

../../../../projets/socrate/IMG/DSC_0219.jpg

Figure 3. Photo of the FIT/CortexLab experimentation room before adding SDR *nodes to the ceiling*

TRISKELL Project-Team

2.2. Highlights of the Year

- Prof. Robert France (Colorado State University, USA) has been awarded an Inria International Chair. He will join the team in the next five years to develop a research project on multi-concern software modeling and variability.

- The paper Generating Counterexamples of Model-based Software Product Lines: An Exploratory (J. B. Ferreira Filho, O. Barais, M. Acher, J. Le Noir, B. Baudry.) received a best student paper award at the International Software Product Line Conference

- 9 PhD students defended their thesis in 2013

BEST PAPERS AWARDS :

[49] **SPLC - 17th International Software Product Line Conference**. J. B. FERREIRA FILHO, O. BARAIS, M. ACHER, J. LE NOIR, B. BAUDRY.

URBANET Team (section vide)

ALICE Project-Team (section vide)

ALPAGE Project-Team

2.2. Highlights of the Year

2.2.1. *Nomination at the Institut Universitaire de France*

Laurence Danlos is a Senior Member of the Institut Universitaire de France since October 2013

2.2.2. *Statistical Parsing of Morphologically Rich Languages*

Since several years, Djamé Seddah, together with Marie-Hélène Candito and more generally the whole Alpage team, has played a major role in setting up and animating an international network of researchers focusing on parsing morphologically rich languages (MRLs).

This year, Djamé Seddah has led the organization of the **first shared task on parsing MRLs**, hosted by the fourth SPMRL workshop [29]. Its primary goal was to bring forward work on parsing morphologically ambiguous input in both dependency and constituency parsing, and to show the state of the art for MRLs. We compiled data for as many as 9 languages, which represents an immense scientific and technical challenge.

Alpage participated to this shared task with two systems. The first one, applied to French only, belongs to the Bonsai series of parsers, adapted in collaboration with the LIGM in order to better deal with multi-word units [19]. It was **ranked first**, and is therefore the best known parser for French to date.

The other Alpage system which took part to this shared task is Éric Villemonte De La Clergerie's new DyALog-based shift-reduced parser [30], which was applied to all 9 languages. It is the **second best system overall**.

AVIZ Project-Team

2.3. Highlights of the Year

AVIZ received one best paper award and one best paper honorable mention award at the ACM CHI Conference on Human Factors in Computing Systems.

AVIZ received one best paper honorable mention award and one best poster award [30] at the IEEE Visualization conference.

AVIZ received one best paper honorable mention award at the IFIP TC13 Conference on Human-Computer Interaction (INTERACT).

Petra Isenberg co-organized the Dagstuhl seminar on "Interaction with Information for Visual Reasoning", August 25–30.

Aviz hired a Fab manager for Digiscope's Fab Lab (http://fablabdigiscope.wordpress.com/).

Aviz organized a Workshop on The New Statistics: Estimation for Better Research (http://www.aviz.fr/Research/NewStatisticsWorkshop).

Aviz organized a visit with demos for the CHI 2013 conference attendees (http://www.aviz.fr/Research/Visit2013).

Aviz co-organized the International Workshop on Interactive Ultra-High-Resolution Displays (http://www.powerwall.mdx.ac.uk/) as part of CHI 2013.

Yvonne Jansen and Pierre Dragicevic were interviewed by Enrico Bertini and Moritz Stefaner (http://datastori.es/episode17-data-sculptures/) on physical visualizations.

Petra Isenberg was interviewed by Enrico Bertini and Moritz Stefaner (http://datastori.es/ds26-visualization-beyond-desktop/) about her work on Visualization Beyond the Desktop.

BEST PAPERS AWARDS :

[28] **Proceedings of the 2013 Annual Conference on Human Factors in Computing Systems (CHI 2013)**. B. ALPER, B. BACH, N. HENRY RICHE, T. ISENBERG, J.-D. FEKETE.

[36] **Proceedings of the Conference on Human Factors in Computing Systems (CHI)**. J. FUCHS, F. FISCHER, F. MANSMANN, E. BERTINI, P. ISENBERG.

[] **IEEE Transactions on Visualization and Computer Graphics**. C. PERIN, R. VUILLEMOT, J.-D. FEKETE.

[38] **Proceedings of the IFIP TC13 Conference on Human-Computer Interaction (INTERACT)**. S. HURON, P. ISENBERG, J.-D. FEKETE.

AYIN Team

2.2. Highlights of the Year

- Ian Jermyn rejoined Inria as a CR1 in the Ayin team in October 2013.

- Yuliya Tarabalka was invited to present the work of the Ayin team at the India-France Technology Summit in New Delhi, India in October.

- Josiane Zerubia was invited to present Ayin's research on remote sensing at the Institute of Mathematics and its Applications, University of Minnesota, USA, in September.

DAHU Project-Team

2.2. Highlights of the Year

Serge Abiteboul was awarded the 2013 Milner awards.

DREAM Project-Team

2.3. Highlights of the Year

Prof. Torsten Schaub (Potsdam University, Germany) has been awarded an Inria international senior grant from 2103 to 2017 for a research project with EPI-DREAM. This research will be concerned with using ASP for data stream post-mining.

E-MOTION Project-Team

2.2. Highlights of the Year

Awards :

- C . Laugier, Ph. Martinet and C. Stiller have received the "Most Active IEEE RAS Technical Committee Award of the year 2013" for the Technical Committee they are co-chairing on "Autonomous Ground Vehicles and Intelligent Transportation Systems". This prize has been announced during the award ceremony of the annual IEEE ICRA conference in Karlsruhe.

- C. Laugier has been invited by the French Ministry of Foreign Affairs and by the Taiwan Office in Paris to participate has a French Robotics Expert, to the high level French delegation conducted by Mme Edith Cresson (former prime minister), October 2013.

- C. Laugier was a member of the Best paper Award Committee of the IEEE ICRA 2013 conference, Karlsruhe, May 2013.

- C. Laugier was chair of the Best paper Award Committee of the 5th PPNIV Workshop organized in the scope of the IEEE/RSJ IROS 2013 conference. The prize was given by the IEEE RAS Technical Committee on "Autonomous Ground Vehicles and Intelligent Transportation Systems".

Patents:

- S. Lefevre, C. Laugier, and J. Ibanez-Guzman have submitted a patent (Inria and Renault) on "Method and process for the evaluation of the risk of collision at intersections". The patent has initially been submitted in 2012 and finalized in 2013.

- I. Paromtchik and C. Laugier have submitted in 2013 a patent on "Method and apparatus for improving driving safety of a vehicle travelling on a road". Patent no. 13305275.3-1803.

- S. Lefevre, C. laugier and R. Bajcsy have submitted in 2013 a patent (Inria and UC Berkeley) on "Decision Making for Collision Avoidance Systems". Patent no. 13306495.6-1810.

Invited talks:

- C. Laugier has given an invited talk entitled "Road Scene Understanding using Bayesian Perception & Risk Assessment" at the Colloquium on Intelligent Robots and Systems, Osaka, June 14th 2013.

- C. Laugier has given an invited talk entitled "Embedded Bayesian Perception and Situation Awareness for Mobile Robots" at a NTU-iCeiRA Seminar on Intelligent Robotics, Taipei, May 2013.

- C. Laugier has given an invited lecture entitled "Embedded Bayesian Perception and Situation Awareness Robots & Intelligent Vehicles" at Toyota Technological Institute, Nagoya, June 2013.

- C. Laugier has given an invited talk entitled "Embedded Perception & Risk Assessment for Intelligent Vehicles" at the Workshop "Vehicle Autonomy in Urban Transportation Systems" IEEE ICRA 2013, Karlsruhe, May 10th 2013.

- C. Laugier has given a keynote talk entitled "Road Scenes Understanding & Risk Assessment using Embedded Bayesian Perception" at the 5th PPNIV Workshop, IEEE IROS 2013, Tokyo, November 2013.

- C. Laugier has given an introductory talk entitled "Embedded Perception for Future Cars" at the Seminar In'Tech "Perception embarquée pour les véhicules de demain", Inria Grenoble Rhône-Alpes, Grenoble, October 24th 2013.

- C. Laugier and A. Spalanzani have given a tutorial on "Autonomous Robotics" at the ISIE 2013 Conference, Taipei, May 2013.

EXMO Project-Team

2.2. Highlights of the Year

This year saw the publication of the second edition, largely revised and augmented, of our reference book *Ontology matching* [12].

FLOWERS Project-Team

2.2. Highlights of the Year

In April 2013 at the International Conference on Robotics and Automation in Karlsruhe, Freek Stulp received the "King-Sun Fu Best Paper Award of the IEEE Transactions on Robotics". As T-RO has on of the highest impact factors, this is considered to be the highest paper prize in robotics. It is the first time this prize has been awarded to an article on machine learning.

The team has announced in october 2013 the open-source release of the Poppy humanoid robot. Poppy is to our knowledge the first humanoid robot in the world to be at the same time open-source (hardware and software) and based on 3D printing techniques. It is based on robust, flexible, easy-to-use hardware and software. Its development aims at providing an affordable and hackable humanoid robot for science, education, art and geeks. Poppy was initially made for our research project about understanding the role of morphology in biped locomotion, and full-body physical and social interaction in robots and humans. The robot has generated a huge enthusiasm from geeks, academic laboratories, and educational institutions, and within the first two months already 200 beta-testers registered to rebuild their own copy of the robot. Dozens of articles appeared on the internet and printed press, and the Poppy videos was viewed nearly 40k times. Web site: http://www.poppy-project.org.

The Flowers team made major achievements in diffusing science and technology towards the general public. Pierre-Yves Oudeyer published a popular science book entitled "Aux sources de la parole" at Odile Jacob, and was invited to talk about our research on major radio channels (e.g. France Inter, France Culture, France Info). http://www.pyoudeyer.com/AuxSourcesDeLaParole.htm

The team also initiated the development of educational activities in "écoles primaires" and "collèges" to have kids discover robotics and programming, as well as ran experiments in "école primaires" in Aquitaine to test novel educational software to help children learn mathematics, and developped within the KidLearn ADT project. This was achieved thanks to the arrival of Didier Roy, former math teacher in college, in the team.

The Flowers team is now coordinating the European project "Semi-autonomous 3rdHand" (coord. Manuel Lopes). The goal is to develop a semi-autonomous robot assistant that acts as a third hand of a human worker in factories, which may be a transformative technology for industry in the coming years. It aims to elaborate techniques allowing to instruct even by an untrained layman worker, allow for efficient knowledge transfer between tasks and enable a effective collaboration between a human worker with a robot third hand. http://3rdhandrobot.eu

The Flowers team started the work on Intelligent Tutoring Systems. The project Kidlearn is a research project studying how machine learning can be applied to intelligent tutoring systems. It aims at developing methodologies and software which adaptively personalize sequences of learning activities to the particularities of each individual student. First experiments were realized in elementary schools of Région Aquitaine, where 6-7 year old kids learnt elements of mathematics with our software. https://flowers.inria.fr/research/kidlearn/

An associated team, called Neurocuriosity, was created between Flowers and the Cognitive Neuroscience lab of Jacqueline Gottlieb at Univ. Columbia, NY. The goal of this associated team is to investigate mechanisms of spontaneous exploration and learning in humans by setting up experiments allowing to confirm or falsify predictions made by computational models previously developped by the team. This constitutes a crucial collaboration between developmental robotics and cognitive neuroscience. This joint work already led to a major publication on curiosity and information seeking, in the prestigious Trends in Cognitive Science journal (impact factor: 16.5).[10]

Thomas Cederborgs PhD thesis "A Formal Approach to Social Learning: Exploring Language Acquisition Through Imitation" won the "ThesAqt" prize, awarded by Region Aquitaine who gives this awards to excellent theses in the region.

GRAPHIK Project-Team

2.5. Highlights of the Year

- Rallou Thomopoulos defended her HDR, entitled *Aide à la décision dans les filières agroalimentaires*, on Dec. 2013.
- Three papers from the team were accepted at IJCAI 2013 (International Joint Conference in Artificial Intelligence), the major conference in Artificial Intelligence [41], [37], [42].

HYBRID Project-Team

2.2. Highlights of the Year

- Anatole Lécuyer was awarded the Inria-Académie des Sciences (French Academy of Sciences) "Young Researcher" Prize 2013.

- Paper from Anthony Talvas, Maud Marchal and Anatole Lécuyer received the "Best Technote Award" at IEEE Symposium on 3D User Interfaces 2013 (IEEE 3DUI'13).

- Paper from Ferran Argelaguet, David Gómez Jáuregui, Maud Marchal and Anatole Lécuyer was selected as one of the best papers at ACM Symposium on Applied Perception 2013 (ACM SAP'13).

- Paper from Charles Pontonnier, Thierry Duval and Georges Dumont was selected as one of the best papers at IEEE Conference on Cognitive Infocommunication 2013 (IEEE CogIncoCom'2013).

- Two projects in which Hybrid is involved were awarded at the trophies "Loading the Future 2013" organized by French Competitivity Cluster "Images et Réseaux": ACOUSTIC (Grand Prize) (section 8.2.4) and W3D (SME Prize) (section 8.1.2).

- Project OpenViBE2 (section 8.2.5) coordinated by Hybrid has received the "Projet Phare" label by French ANR (National Research Agency). It successfully ended in January 2013 year with a press release and a press conference which generated a massive media coverage.

BEST PAPERS AWARDS :

[42] **IEEE Symposium on 3D User Interfaces**. A. TALVAS, M. MARCHAL, A. LÉCUYER.

[] **ACM Transactions on Applied Perception**. F. ARGELAGUET SANZ, D. A. GÓMEZ JÁUREGUI, M. MARCHAL, A. LÉCUYER.

[40] **IEEE international conference on cognitive infocommunication**. C. PONTONNIER, T. DUVAL, G. DUMONT.

IMAGINE Project-Team

2.2. Highlights of the Year

- One publication was accepted at SIGGRAPH 2013 [14], and two publications at SIGGRAPH Asia 2013 [5], [8].

- Prof. Michael Gleicher from University of Wisconsin is visiting our team during one year.

- France 3 made a video reportage about our team.

- An interview of Marie-Paule Cani was published in People of ACM.

- Marie-Paule Cani became vice chair of Eurographics.

- Computer Vision and Image Understanding 2013 Most cited paper award : *A survey of vision-based methods for action representation, segmentation and recognition*, by Daniel Weinland, Remi Ronfard and Edmond Boyer.

IN-SITU Project-Team

2.3. Highlights of the Year

- InSitu received two best paper awards, one at INTERACT [21] (Brian Shackel award) and the other at IEEE/VRST [28], and one honorable mention at ACM/CHI [34].

- InSitu (Wendy Mackay, General Chair, Michel Beaudouin-Lafon, Technical Program co-chair) organised the 31st ACM Conference on Human Factors in Computing Systems (CHI '13), which took place in Paris and was a great success (3500 participants, 1000 presentations).

- W. Mackay's ERC Advanced Grant, "CREATIV: Creating Human Computer Partnerships", started on June 1, 2013

BEST PAPERS AWARDS :

[21] **INTERACT 2013 - 14th IFIP TC13 Conference on Human-Computer Interaction**. M. ELIAS, M.-A. AUFAURE, A. BEZERIANOS.

[28] **VRST '13: 19th ACM Symposium on Virtual Reality Software and Technology**. C. PINDAT, E. PIETRIGA, O. CHAPUIS, C. PUECH.

[34] **CHI'13 - 31st International Conference on Human Factors in Computing Systems**. J. WAGNER, M. NANCEL, S. GUSTAFSON, S. HUOT, W. E. MACKAY.

LAGADIC Project-Team (section vide)

LEAR Project-Team

2.2. Highlights of the Year

- **TrecVid Multimedia Event Detection challenge.** We participated in the Multimedia Event Detection track of TrecVid 2013, one of the major benchmarks in automatic video analysis. We ranked first out of 18 participants [35].

- **ICCV'13 THUMOS Challenge.** We participated in the action recognition challenge THUMOS, organized in conjunction with ICCV '13. We were ranked first among 16 participants.

- **Optical Flow Benchmark SINTEL.** Our optical flow method DeepFlow [31] was ranked first to the online evaluation benchmark SINTEL from Max Planck Institute.

- **Cor Baayen Award.** Julien Mairal received the Cor Baayen prize, which is awarded annually by ERCIM to a promising young researcher in the field of Informatics and Applied Mathematics.

- **Best Phd prize.** Thomas Mensink, a former PhD student of LEAR, was awarded the best PhD thesis prize from AFRIF.

LINKS Team

2.2. Highlights of the Year

Our paper 'A trichotomy for regular simple path queries on graphs' has been accepted for publication in the Proceedings of the 32nd ACM SIGMOD-SIGACT-SIGART Symposium on *Principles of Database Systems*, PODS 2013, the top conference in the field of theoretical databases. The paper addresses an open problem, i.e. giving a complete classification of regular languages with respect to regular simple path queries (RSPQs), the latter being regular path queries (RPQs) with an additional constraint that prevents traversing two nodes multiple times. In particular, we have characterized the boundary between tractability and intractability, and proved a trichotomy: the evaluation of RSPQs is either AC0 , NL-complete or NP-complete in data complexity.

Pierre Bourhis has been recruited as CNRS researcher at LIFL and joined the team in October.

MAGNET Team

2.2. Highlights of the Year

As first highlight, we are happy to report that our paper "Fiedler Random Fields: A Large-Scale Spectral Approach to Statistical Network Modeling " has been accepted for publication at *Journal of Machine Learning Research*, the top journal in the field of machine learning. This paper's contributions are twofold. First, we introduce the Fiedler delta statistic, based on the Laplacian spectrum of graphs, which allows to dispense with any parametric assumption concerning the modeled network properties. Second, we use the defined statistic to develop the Fiedler random field model, which allows for efficient estimation of edge distributions over large-scale random networks. After analyzing the dependence structure involved in Fiedler random fields, we estimate them over several real-world networks, showing that they achieve a much higher modeling accuracy than other well-known statistical approaches.

The second highlight of the year is the publication of our paper " Improving pairwise coreference models through feature space hierarchy learning" at the annual *Meeting of the Association for Computational Linguistics (ACL 2013)*, the premier conference in the field of Natural Language Processing. This paper proposes a new method for significantly improving the performance of pairwise coreference models. Given a set of indicators, our method learns how to best separate types of mention pairs into equivalence classes for which we construct distinct classification models. In effect, our approach finds an optimal feature space (derived from a base feature set and indicator set) for discriminating coreferential mention pairs. Although our approach explores a very large space of possible feature spaces, it remains tractable by exploiting the structure of the hierarchies built from the indicators. Our experiments on the CoNLL-2012 Shared Task English datasets (gold mentions) indicate that our method is robust relative to different clustering strategies and evaluation metrics, showing large and consistent improvements over a single pairwise model using the same base features.

MAGRIT Project-Team

2.2. Highlights of the Year

- Several members of the team received the *best paper-honourable mention* at ISMAR 2013 for the paper : *Image-guided Simulation of Heterogeneous Tissue Deformation For Augmented Reality during Hepatic Surgery, by by Nazim Haouchine, Jeremie Dequidt, Igor Peterlik, Erwan Kerrien, Marie-Odile Berger, Stéphane Cotin.*

- Gilles Simon received the *Lasting Impact Award* at ISMAR 2013 for the paper: *Markerless Tracking using Planar Structures in the Scene by Simon Gilles, Andrew W. Fitzgibbon, Andrew Zisserman in Proceedings of the IEEE and ACM International Symposium on Augmented Reality, 2000 (ISAR), pages 120-128 .*

BEST PAPERS AWARDS :

[18] **ISMAR - IEEE International Symposium on Mixed and Augmented Reality 2013**. N. HAOUCHINE, J. DEQUIDT, I. PETERLIK, E. KERRIEN, M.-O. BERGER, S. COTIN.

MAIA Project-Team

2.2. Highlights of the Year

- the MAIA team was rewarded as "*the most influential team of the research field*" during the French conference on Planification, Decision and Learning (JFPDA 2013).
- M. Tlig, O. Buffet, O. Simonin got the Best Paper Award for their paper presented at RJCIA-13 [38].

MANAO Team

2.3. Highlights of the Year

The first highlight of the year was the team's strong participation at SIGGRAPH: three full technical papers, one talk, and the organization of Inria booth at the exhibition. As a result, the projects got major media coverage (100 000 views of paper videos, publications in internet media) and strong industrial interest (Zeiss, Schneider-Kreuznach, Blender, The Foundry, 3DS).

As a second highlight, the *Eigen* library – whose main contributors include Gaël Guennebaud and Desiré Nuentsa – has received the "High Quality Software in Geometry Processing Award 2013" at the Symposium on Geometry Processing (SGP), a prestigious prize for software development. This prize shows that the library has become a quasi-standard in the field.

The third hightlight is shared with our partners of the ANR SeARCH project (see Section 7.2.1). The results of our collaborative work on the Isis statue was one of the key events of a 6 months exhibition at the "Musée Royal de Mariemont" in Brussels. We also had a major success with our interactive installation "The Revealing Flashlight" (cf. Figure 3). These results were made possible by the new visualization and re-assembly tools developed in our team.

../../../../projets/manao/IMG/amsterdam1.png ../../../projets/manao/IMG/amsterdam2.p

Figure 3. The installation "The Revealing Flashlight" lets visitors explore ancient artifacts interactively.

MAVERICK Project-Team

2.2. Highlights of the Year

Our paper on "Diffusion Curves" [2], originally published in 2008, was featured in the "Research Highlights" section of *Communications of the ACM* [14].

Our work on using the covariance matrix for illumination simulation, in cooperation with F. Durand at MIT, have been published in *ACM Transactions on Graphics* [5].

Our work on on efficient sampling and filtering for displacement maps and texture maps have been published at *Siggraph Asia* and *ACM Transactions on Graphics* [8]. This work was done in cooperation with University of Lyon and University of Montreal. Initial response by the community has been enthusiastic.

BEST PAPER AWARD :

[17] **I3D'13 - ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games**. E. HEITZ, D. NOWROUZEZAHRAI, P. POULIN, F. NEYRET.

MIMETIC Project-Team

2.2. Highlights of the Year

Finalist of best manipulation paper award in ICRA 2013 for the paper entitled: .

Best Paper Award in IEEE Coginfocom 2013 for the paper entitled:

Best Papers Awards :

[24] **IEEE International Conference on Robotics and Automation ICRA**. Y. Li, J.-P. Saut, A. Sahbani, P. Bidaud, J. Pettré, F. Multon.

[28] **IEEE international conference on cognitive infocommunication**. C. Pontonnier, T. Duval, G. Dumont.

MINT Project-Team

2.2. Highlights of the Year

Gery Casiez was hired as full Professor.

Fanny Chevalier has been recruited as an Inria Researcher.

MORPHEO Team

2.2. Highlights of the Year

The work on human motion capture, done in collaboration with the technical university of Munich, received the best paper runner up award at the 3DV conference for the article: This work contributes to the field with an approach that recovers both the shape and the articulated pose of a human body over time sequences and using multiple videos.

BEST PAPERS AWARDS :

[7] **3DV - International Conference on 3D Vision - 2013**. C.-H. HUANG, E. BOYER, S. ILIC.

OAK Project-Team

2.1. Highlights of the Year

The year has seen the finalization of five major research activities: XML materialized view maintenance [4], XML static type analysis [5], document management through semantic annotations [7], scalable dissemination of Web data [8], and XML type-based projection [13]. The respective five publications appeared in A* journals (according to the CORE ERA ranking).

ORPAILLEUR Project-Team

2.2. Highlights of the Year

For the highlights of the year, we would like to mention the work of Anisah Ghoorah on the KBDOCK system which was accepted in the Database issue of Nucleic Acids Research [6] and as well her paper on "Protein Docking Using Case-Based Reasoning" for the special issue CAPRI [21].

PANAMA Project-Team

2.4. Highlights of the Year

R. Gribonval was elevated to the grade of IEEE Fellow *for contributions to the theory and applications of sparse signal processing*.

Frédéric Bimbot was General Chairman of the Interspeech 2013 Conference in Lyon which gathered around 1400 participants.

The IEEE 2012 SPS Young Author Best Paper Award has been awarded to Ngoc Duong [4], former Ph.D. student in the METISS team.

PAROLE Project-Team (section vide)

PERCEPTION Team

2.2. Highlights of the Year

2.2.1. *European project HUMAVIPS.*

The European project HUMAVIPS – Humanoids with Auditory and Visual Abilities in Populated Spaces – is a 36-month FP7 STREP project coordinated by Radu Horaud and which started in 2010. The project addressed multimodal perception and cognitive issues associated with the computational development of a social robot. The objective was to endow humanoid robots with audiovisual (AV) abilities: exploration, recognition, and interaction, such that they exhibit adequate behavior when dealing with a group of people. Research and technological developments emphasized the role played by multimodal perception within principled models of human-robot interaction and of humanoid behavior. The HUMAVIPS project was successfully terminated in January 2013.

An article about *Integrating Smart Robots into Society* refers to HUMAVIPS. The article stresses the role of cognition in human-robot interaction and refers to HUMAVIPS as one of the FP7 projects that has paved the way towards the concept of audio-visual robotics. The article was published in HORIZON, which is Europe's Research & Innovation Magazine.

2.2.2. *ERC Advanced Grant VHIA.*

The PERCEPTION team is pleased to announce that Radu Horaud was awarded an ERC Advanced Grant for his project "Vision and Hearing in Action" (VHIA). This five year project (2014-2019) will develop the concept of social robots.

2.2.3. *Best Paper Award at IEEE MMSP'13.*

The article received the "Best Paper Award" at the IEEE International Workshop on Multimedia Signal Processing (MMSP'13), Pula, Italy, September-October 2013. The paper addresses the problem of aligning visual and auditory data using a sensor that is composed of a camera-pair and a microphone-pair. The original contribution of the paper is a method for audio-visual data aligning through estimation of the 3D positions of the microphones in the visual centred coordinate frame defined by the stereo camera-pair. Please consult http://www.mmsp2013.org/mmsp2013_awards.php and [24].

BEST PAPERS AWARDS :

[24] **MMSP 2013 - IEEE International Workshop on Multimedia Signal Processing**. V. KHALIDOV, F. FORBES, R. HORAUD.

POTIOC Team

2.2. Highlights of the Year

- Potioc has organized IHM 2013, the French conference on Human-Computer Interaction, in cooperation with the AFIHM association. This conference gathered about 125 participants. A dedicated collection has been created on HAL.

- A tutorial about interaction techniques for 3D environments was presented at Eurographics 2013 [13] and Web3D 2013 [14].

Prima Project-Team (section vide)

REVES Project-Team

2.2. Highlights of the Year

The past year was highly productive, with a large number of top-level publications. Most notably, 4 papers ([11], [14], [12], [18]) were presented at ACM SIGGRAPH 2013 in Los Angeles. These ACM Transactions on Graphics papers are the best publication in our field.

The continuing industrial interest in our work, both via bilateral contracts and EU initiatives with companies has grown in this year, on the topics of image-based relighting, image-based rendering and materials for vector art. This is a very promising trend for the future.

SÉMAGRAMME Project-Team

2.2. Highlights of the Year

Dr. Ekatarina Lebedeva (together with Wesley H. Holliday, Stanford University) winned the E.W. Beth Dissertation Prize, awarded by FoLLI (the Association for Logic, Language, and Information) to outstanding dissertations in the fields of Logic, Language, and Information. Dr. Ekatarina Lebedeva prepared her PhD thesis in the Sémagramme team, under the supervision of Philippe de Groote. She obtained her PhD degree from the *Université de Lorraine* in April 2012.

SIROCCO Project-Team

2.6. Highlights of the Year

- A joint contribution between Inria/SIROCCO, Qualcomm and Mediatek has been adopted to be part of the HEVC backward compatible 3DV standard, in July 2013.
- Nomination of C. Guillemot as IEEE Fellow.

SMIS Project-Team (section vide)

STARS Project-Team

2.2. Highlights of the Year

Stars designs cognitive vision systems for activity recognition based on sound software engineering paradigms.

During this period, we have designed several novel algorithms for activity recognition systems. In particular, we have extended an efficient algorithm for tuning automatically the parameters of the people tracking algorithm.

We have designed a compact system for activity recognition running on a mini-PC which is easily deployable using RGBD video cameras. This algorithm has been tested on more than 70 videos of older adults performing 15 min of physical exercises and cognitive tasks. This evaluation has been part of a large clinical trial with Nice Hospital to characterize the behaviour profile of Alzheimer patients compared to healthy older people.

We have also been able to demonstrate the tracking and the recognition of group behaviours in live in Paris subway. We have stored efficiently in a huge database the meta-data (e.g. people trajectories) generated from the processing of 8 video cameras, each of them lasting several days. From these meta-data, we have automatically discovered few hundreds of rare events, such as loitering, collapsing, ... to display them on the screen of subway security operators.

Monique Thonnat has been at the head of the Inria Bordeaux Center since the first of November 2013. She is still working part-time in Stars team.

TEXMEX Project-Team

2.2. Highlights of the Year

- We have won the FGcomp'2013 challenge, in conjunction with Imagenet, for fine-grain classification of images.

- Best paper award to Cédric Penet at Content-Based Multimedia Indexing .

BEST PAPERS AWARDS :

[51] **CBMI - 11th International Workshop on Content Based Multimedia Indexing - 2013**. C. PENET, C.-H. DEMARTY, G. GRAVIER, P. GROS.

TITANE Team

2.2. Highlights of the Year

We obtained the second best paper award at the EUROGRAPHICS Symposium on Geometry Processing.

TYREX Team

2.2. Highlights of the Year

Pierre Genevès, CNRS researcher, received the bronze medal of CNRS in a ceremony organized on october 4th, 2013, in Grenoble. This medal was awarded by the CNRS INS2I institute.

WILLOW Project-Team

2.2. Highlights of the Year

- J. Sivic was awarded a Starting ERC Grant (2014-2018).
- J. Sivic, I. Laptev and J. Ponce (together with C. Schmid, Inria Grenoble) co-organized one week summer school on visual recognition and machine learning http://www.di.ens.fr/willow/events/cvml2013/. The school has attracted 177 participants from 34 countries including Australia, Brazil, Canada, China, Japan, Korea, Russia, Singapore and the United States.

WIMMICS Project-Team

2.2. Highlights of the Year

Best Paper Award at IEEE International Conference on Cognitive Infocommunications: Franck Berthelon and Peter Sander, *Regression Algorithm for Emotion Detection* [53].

Best Demo Award at ESWC: Nicolas Marie, Myriam Ribière, Fabien Gandon and Damien Legrand, *Exploratory search on the top of DBpedia chapters with the Discovery Hub application*.

Second best poster at SSSW, the 10th Summer School on Ontology Engineering and the Semantic Web, Rakebul Hasan and Fabien Gandon, *Linked Justifications*.

First ANR LabCom (joint laboratory SMILK) in computer science with the company Viseo.

The project *The Showcase Machine*, follow-up of DiscoveryHub, wins the challenge *Jeune Pousse* at Telecom Valley in Sophia Antipolis.

BEST PAPER AWARD :

[31] **ESWC - 10th International Conference on The Semantic Web: Semantics and Big Data - 2013**. E. CABRIO, S. VILLATA, F. GANDON.

ZENITH Project-Team

2.2. Highlights of the Year

- BigdataNet: an associated team between Zenith and the distributed systems team of Profs. Amr El Abbadi and Divy Agrawal at University of California, Santa Barbara, since january 2013.

- Since october, Zenith participates in the European FP7 IP CoherentPaaS Project.

- The release of PlantNet iPhone App [1], an image sharing and retrieval application for the identification of plants integrating several research contributions of Alexis Joly.

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[1] https://itunes.apple.com/en/app/plantnet/id600547573

COPRIN Project-Team (section vide)

IMARA Project-Team

2.2. Highlights of the Year

- The Grand Prix National de l'Ingénierie 2013 (Grand National Engineering Award 2013 [2]) has been awarded to AKKA Technologies and Inria for the Link & Go project: the first dual-mode concept for an electric vehicle.

- Best paper award for the paper entitled "ABV- A Low Speed Automation Project to Study the Technical Feasibility of Fully Automated Driving" [41] at the workshop on Mobility Assistance and Service Robotics (November 9th, 2013, Kumamoto, Japan).

- Carrefour du PREDIT 2013 Prize: Fawzi Nashashibi was the winner of the Carrefour du PREDIT 2013 for the project SPEEDCAM he coordinated (Speed limit determination using camera and maps). The other partners of this 3-years ANR-DEUFRAKO project are: ARMINES, VALEO, DAIMLER, HOSCHULE AALEN.

- As a member of the Robotics Theme in the field "perception, cognition and interaction" at Inria, IMARA passed successfully the evaluation of the theme organized in March 2013. The evaluation committee was composed of international experts from both academia and industrial backgrounds.

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[2]http://www.cgedd.developpement-durable.gouv.fr/le-grand-prix-national-de-l-r159.html