



RESEARCH CENTER
Grenoble - Rhône-Alpes

FIELD

Activity Report 2014

Section Highlights of the Team

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ALGORITHMICS, PROGRAMMING, SOFTWARE AND ARCHITECTURE	
1. ARIC Project-Team (section vide)	5
2. COMPSYS Project-Team	6
3. CONVECS Project-Team (section vide)	7
4. DICE Team (section vide)	8
5. GCG Team	9
6. PRIVATICS Project-Team	10
7. SPADES Team (section vide)	11
APPLIED MATHEMATICS, COMPUTATION AND SIMULATION	
8. BIPOP Project-Team	12
9. MISTIS Project-Team	13
10. NANO-D Project-Team (section vide)	14
11. NECS Project-Team	15
12. OPALE Project-Team	16
DIGITAL HEALTH, BIOLOGY AND EARTH	
13. BAMBOO Project-Team (section vide)	17
14. BEAGLE Project-Team	18
15. DRACULA Project-Team	19
16. IBIS Project-Team	20
17. KALIFFE Project-Team (section vide)	21
18. MOISE Project-Team (section vide)	22
19. NUMED Project-Team	23
20. STEEP Team	24
NETWORKS, SYSTEMS AND SERVICES, DISTRIBUTED COMPUTING	
21. AVALON Project-Team (section vide)	25
22. CTRL-A Exploratory Action	26
23. DANTE Team	27
24. MESCAL Project-Team (section vide)	28
25. MOAIS Project-Team (section vide)	29
26. ROMA Team	30
27. SOCRATE Project-Team	31
28. TYREX Project-Team (section vide)	32
29. URBANET Team	33
PERCEPTION, COGNITION AND INTERACTION	
30. E-MOTION Project-Team	34
31. EXMO Project-Team	35
32. IMAGINE Project-Team	36
33. LEAR Project-Team	37
34. MAVERICK Project-Team	38
35. MORPHEO Project-Team (section vide)	39
36. PERCEPTION Project-Team	40

37. PRIMA Project-Team 41

ARIC Project-Team (section vide)

COMPSYS Project-Team

6.1. Highlights of the Year

For 2014, from the point of view of organization, funding, collaborations, the main points to highlight are:

- Christophe Alias and Alexandru Plesco have co-founded the XTREMLOGIC start-up in January 2014 (see Section 7.2), following the incubation of Zettice. XTREMLOGIC recently won the “concours région rhône-alpes” grant in November 2014 (40k).
- Tomofumi Yuki was hired as an Inria researcher and became a permanent member of Compsys.
- The 1988 “Array Expansion” seminal paper of Paul Feautrier has been selected for the 25th Anniversary Volume of the ACM International Conference on Supercomputing (ICS) together with 34 other papers selected from the 1800 papers published from 1987 to 2011. A short “reminescence” paper [13] was written for the occasion.
- The team was evaluated in Nov. 2014 by the HCERES (new name of AERES), as part of the LIP lab evaluation. The report has not been received yet.

From a scientific point of view, the shift, in Compsys III, towards the analysis of parallel programs and the extensions of the polyhedral model, both in terms of techniques and applications, is continuing, see the section “New Results”, in particular:

- The design (by Christophe Alias and Alexandru Plesco) of a HLS compiler technology (see Section 6.2), patented by Inria [12] and transferred to XTREMLOGIC under an Inria licence (see Section 5.5).
- Two new static analyses: a more precise array bound check analysis [9] (see Section 6.3) and a more scalable termination algorithm for C programs (see Section 6.4).
- A novel equivalence-checking algorithm [7] modulo associativity/commutativity, which is a first step towards semantic program transformations (see Section 6.5).
- A groundbreaking introduction of polyhedral techniques for the analysis of parallel programs, in particular X10 (see [29] and [6]) and OpenStream (see Section 6.6).
- A seminal paper [5] introducing polynomial techniques in program analysis and compilation (see Section 6.7).
- Innovative contributions on parametric tiling [8], [3], [4] as extensions of the polyhedral model (see Sections 6.8 and 6.9).

CONVECS Project-Team (section vide)

DICE Team (section vide)

GCG Team

6.1. Highlights of the Year

Graduate Research Award of the OSU department in 2015 for Venmugil Elango (co-advised by Fabrice Rastello)

PRIVATICS Project-Team

5.1. Highlights of the Year

Vincent Roca was awarded the 3rd Applied Research price of the Fédération des Industries Electriques, Electroniques et Communications (FIEEC), for his transfer activities to the Expway French SME, Lyon, October 8th, 2014.

The team got two major contributions:

- *A Case Study: Privacy Preserving Release of Spatio-temporal Density in Paris* was published by Gergely Acs and Castelluccia at KDD 2014.
- *Censorship in the Wild: Analyzing Internet Filtering in Syria* was published by Chaabane Abdelberi, Mathieu Cunche, and Mohamed Ali Kaafar at IMC 2014.

SPADES Team (section vide)

BIPOP Project-Team

6.1. Highlights of the Year

- Bernard Brogliato: keynote speaker at ICDVC-2014, 4th International Conference on Dynamics, Vibration and Control, August 23-25, 2014 in Shanghai, China. <http://www.icdvc2014.org/>

MISTIS Project-Team

6.1. Highlights of the Year

6.1.1. P-Locus software and Pixyl start-up project

The work on the P-Locus software has been exploited in order to create a start-up in January 2015. The project called Pixyl have been accepted by the GATE1 incubator and has been awarded a BPI emergence prize. It is led by Senan Doyle (future CEO). The other co-founders are Michel Dojat (INSERM, GIN), Florence Forbes (Inria, Mistis) and IT-Translation.

NANO-D Project-Team (section vide)

NECS Project-Team

6.1. Highlights of the Year

- C. Canudas de Wit serves as General Chair for the European Control Conference (ECC'14), Strasbourg, France, Jul. 2014 (<http://www.ecc14.eu>).
- Launch of the SPEEDD EU FP7 project in Feb. 2014.
- Launch of the COMFORT project, which supports the associate Team between Inria project-team NeCS and the Berkeley University project PATH (<http://necs.inrialpes.fr/pages/projects/comfort.php>).
- Launch of the LOCATE-ME Persyval project (Apr. 2014 to Aug. 2015) in collaboration with the Tyrex team.
- The team has organized the Hycon2 Show day in May 2014 (<http://www.inria.fr/en/centre/grenoble/calendar/hycon2-show-day-traffic-modeling-estimation-and-control>).

OPALE Project-Team

6.1. Highlights of the Year

Paola Goatin was awarded the “*Prix Inria - Académie des sciences du jeune chercheur*”.

BAMBOO Project-Team (section vide)

BEAGLE Project-Team

5.1. Highlights of the Year

We organized two satellite workshops of international conferences:

- The Aevol tutorial during ALife 2014 (July 30 - August 2, New York) <http://www.aevol.fr/alifeTutorial>
- The "Computational Methods and Modeling of Astrocyte Physiology and Neuron-Glia Interactions" workshop during the Computational NeuroScience 2014 conference (July 26 - 31, Quebec City, Canada)

These highlight our active presence in the scientific life of our two sub-domains in major conferences.

DRACULA Project-Team

6.1. Highlights of the Year

- Marine Jacquier and Fabien Crauste (in collaboration with C.O. Soulage and H.A. Soul) published a paper ([18], see also § 6.7) in PLoS ONE 2014.
- Sotiris Prokopiou, Loic Barbarroux, Samuel Bernard, Olivier Gandrillon and Fabien Crauste (in collaboration with J. Mafille, Y. Leverrier, C. Arpin and J. Marvel) published a paper ([21], see also § 6.2) in Computation 2014.
- We organized a session "Deterministic and stochastic models in biology and medicine" at 10th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Madrid (Spain), 7 - 11 July 2014 <http://www.aimsociences.org/conferences/2014/>.
- Our project entitled "Prion and Alzheimer: mathematical modeling and experiments dealing with a dangerous liaison" has been granted by the French Association France Alzheimer, and has been selected with 3 other projects amongst 14 supported works to be part of a scientific popularizing broadcasting campaign through a short scientific cartoon <http://www.francealzheimer.org/projets-soutenus-cette-ann%C3%A9e/lab-alz-comprendre-enjeux-recherche/964> and <https://www.youtube.com/watch?v=X0mLf8IJhV4&list=PLCq-e7n2r6Wgo3kaseDHetNAPAG7y9B-d>.

IBIS Project-Team

5.1. Highlights of the Year

A paper based on the PhD thesis of Diana Stefan was accepted for *PLoS Computational Biology* this year [7].

KALIFFE Project-Team (section vide)

MOISE Project-Team (section vide)

NUMED Project-Team

5.1. Highlights of the Year

Vincent Calvez has been awarded an ERC Grant and the prestigious Bronze medal CNRS.

STEPP Team

6.1. Highlights of the Year

This year has seen a number of major advances in the team research projects, on several fronts. The first one concerns the most important and time consuming project, namely integrated land use, activity and transport modelling (LUTI modelling). In this respect, the results described in 6.8 below constitute probably the first set of works contributing sophisticated numerical procedures to the calibration and validation of the TRANUS LUTI model.

The second significant breakthrough concerns the completion of a downscaling method for Material Flow Analysis (MFA), a key aspect in the characterization and understanding of territorial metabolism for decision-help purposes (section 6.2).

Finally, the modelling effort on land use change for the ESNET project has now been mostly completed, and an operational LUCC model has been calibrated and validated for this project (section 6.3).

AVALON Project-Team (section vide)

CTRL-A Exploratory Action

6.1. Highlights of the Year

We have been invited to participate to the organization of events, which highlight our active presence in the scientific life in the two domains which we are bridging :

- autonomic computing: Eric Rutten is PC member, as well as workshops chair, of the 12th IEEE International Conference on Autonomic Computing, ICAC 2015 (<http://icac2015.imag.fr/>), and PC co-chair of the 3rd IEEE International Conference on Cloud and Autonomic Computing, CAC 2015 (<http://autonomic-conference.org/>), the two major conferences on the topic.
- control: Eric Rutten is organizer of a special session on discrete control for computing at the 12th IFAC - IEEE International Workshop on Discrete Event Systems, WODES 2014 (<http://wodes2014.lurpa.ens-cachan.fr/>), the main conference specialized in Discrete Event Systems, ; he is on the IFAC Technical Committee 1.3 on Discrete Event and Hybrid Systems, (<http://tc.ifac-control.org/1/3/>) and on the IEEE Control Systems Society Discrete Event Systems Technical Committee (<http://discrete-event-systems.ieeecss.org>).

DANTE Team

6.1. Highlights of the Year

6.1.1. *The Internet of Things: A new equipments of excellence*

Inaugurated last autumn, the very large scale IoT-LAB platform (<https://www.iot-lab.info>) is strengthening the capabilities of the FIT equipment of excellence dedicated to the Internet of Things. Offering a unique wide-ranging collection of equipment, these laboratories are available to both researchers and commercial companies alike.

IoT-LAB is a large-scale experimental platform for communicating objects and networks of sensors. It enables the rapid deployment of experiments and the collection of large amounts of data. It includes over 2700 sensor nodes, distributed over six sites in France, offering a wide range of different processor architectures and radio components. IoT-LAB is available for use on line. It is already used by over 300 users in forty countries, including around ten commercial companies. As of the end of October 2014, some 10 000 experiments had already been carried out.

6.1.2. *Graph-based signal processing*

Our first results towards the definition of a digital framework for signal processing on graphs constitutes an important outcome of DANTE's activity in 2014. Our participation to this emerging discipline was marked with several scientific recognitions: publication in the main DSP conference [14], involvement in the first ANR project focusing on this theme and retained for funding (2015-2019), we are in charge of the organisation of a Special Session dedicated to "Methodologies for signal processing on graphs" at Eusipco conference (2015).

6.1.3. *Complex contagion process*

Diffusion of innovation can be interpreted as a social spreading phenomena governed by the impact of media and social interactions. Although these mechanisms have been identified by quantitative theories, their role and relative importance are not entirely understood, since empirical verification has so far been hindered by the lack of appropriate data. Here we analyse a dataset recording the spreading dynamics of the world's largest Voice over Internet Protocol service to empirically support the assumptions behind models of social contagion. We show that the rate of spontaneous service adoption is constant, the probability of adoption via social influence is linearly proportional to the fraction of adopting neighbors, and the rate of service termination is time-invariant and independent of the behavior of peers. By implementing the detected diffusion mechanisms into a dynamical agent-based model, we are able to emulate the adoption dynamics of the service in several countries worldwide. This approach enables us to make medium-term predictions of service adoption and disclose dependencies between the dynamics of innovation spreading and the socioeconomic development of a country. This work was recently published in the Journal of the Royal Society Interface.

MESCAL Project-Team (section vide)

MOAIS Project-Team (section vide)

ROMA Team

6.1. Highlights of the Year

Yves Robert was awarded the 2014 IEEE Technical Committee on Scalable Computing (TCSC) Award for Excellence.

In October 2014, CERFACS, ENS Lyon, INPT, Inria and University of Bordeaux launched a consortium around the software package MUMPS (see <http://mumps-consortium.org>).

SOCRATE Project-Team

6.1. Highlights of the Year

6.1.1. FIT/CortexLab Inauguration

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 is be composed of four main parts: a Network Operations Center (NOC), a set of Embedded Communicating Object (ECO) test-beds, a set of wireless OneLab test-beds, and a cognitive radio test-bed (CortexLab) deployed by the Socrate team in the Citi lab. In 2014 the construction of the room was finished see Figure 5 . SDR nodes have installed in the room, 42 industrial PCs (Aplus Nuvo-3000E/P), 22 NI radio boards (USRP) and 18 Nutaq boards (PicoSDR, 2x2 and 4X4) can be programmed from internet now.

A very successfully inauguration took place on the 28th October 2014⁰, with the noticable venue of Vincent Poor, Dean of School of Engineering and Applied Science of Princeton University.

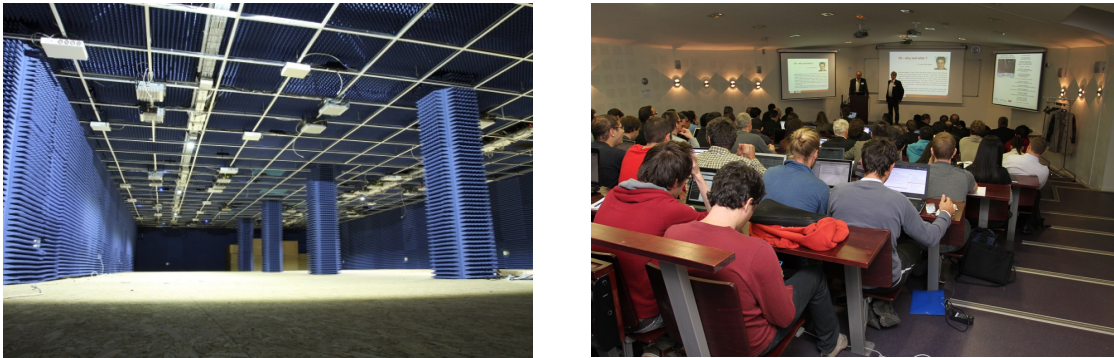


Figure 5. Photo of the FIT/CortexLab experimentation room installed and a snapshot of the inauguration meeting

⁰<http://www.inria.fr/centre/grenoble/actualites/inauguration-reussie-de-la-plateforme-cortexlab-equipex-fit>

TYREX Project-Team (section vide)

URBANET Team

6.1. Highlights of the Year

Two scientific results can be distinguished in UrbaNet activity this year. First of all, the work did in collaboration with Orange Labs during the PhD thesis of O. Erdene-Ochir (defended in 2013) led to a patent [38] related to routing in wireless sensor networks under resiliency constraints.

A second important result is represented by the book chapter "Wireless Access Networks for Smart Cities" [31], a common contribution of all the permanent members of the team. We hope that this chapter will become the reference on wireless networking within the new and dynamic smart cities community.

E-MOTION Project-Team

5.1. Highlights of the Year

- C. Laugier, E. Mazer and K. Mekhnacha have been finalists for the Eurobotics Technology Award 2014. Title “Bayesian perception & Decision: from theory to industrial applications”. March 2014.
- A. Nègre, L. Rummelhard, M. Perrollaz and C. Laugier had applied for a petenent "Procédé d'analyse d'une scene dybnamique, module d'analyse et programme d'ordinateur associés".

EXMO Project-Team

6.1. Highlights of the Year

- Our work on link key extraction and evaluation (§6.3.4) has been published at ECAI 2014.
- Jérôme Euzenat has been elected fellow of the European Coordination Committee for Artificial Intelligence (ECCAI).

IMAGINE Project-Team

6.1. Highlights of the Year

- Vector Graphics Complexes, an new structure for 2D illustration developed in collaboration with UBC, resulted into a publication at ACM SIGGRAPH [4]. This superset of multi-layers graphics and of planar maps, enable intuitive design and deformation of 2D illustrations thanks to the separation of geometry from topology.
- Our work on elastic implicit skinning, a collaboration with U. Toulouse, Victoria University, and Inria Bordeaux was accepted at ACM SIGGRAPH Asia [16]. Thanks to robust iso-surface tracking, this method captures dynamic skin siding effects and can be used with extreme bending angles.

LEAR Project-Team

6.1. Highlights of the Year

- Cordelia Schmid received the **Longuet-Higgins prize** for fundamental contributions in computer vision that have withstood the test of time, 2014.
- We participated to the **Trecvid 2014 Multimedia Event Detection** challenge. We ranked first on one of the four tracks (Ad-hoc training videos with 10 examples per class).
- We participated to the **THUMOS 2014 challenge**. We obtained top ranked results in the localization track of the Thumos 2014 Action Recognition Challenge. The goal of the challenge is to evaluate large-scale action recognition in natural settings.

MAVERICK Project-Team

5.1. Highlights of the Year

The impacting PhD work [3] of Eric Heitz on *appearance filtering* (see section 5.5.1) has received a very good reception in both academic and industrial world, including several “best paper” prizes in 2013 and 2014, invitation to participate to the Siggraph Course on Photorealistic Rendering [13], and statements of importance and/or integration by reference peoples and CG companies.

BEST PAPER AWARD :

[] **Computer Graphics Forum**. E. HEITZ, E. D'EON.

MORPHEO Project-Team (section vide)

PERCEPTION Project-Team

5.1. Highlights of the Year

- In 2014 Antoine Deleforge (team member 2009-2013) received the **Signal, Image and Vision best PhD prize** for his thesis “*Acoustic Space Mapping: A Machine Learning Approach to Sound Source Separation and Localization*”, defended in December 2013 and advised by Radu Horaud. The prize is jointly awarded by GDR ISIS, Club EEA, and GRETSI.

Website: <http://www.inria.fr/centre/grenoble/actualites/apprendre-a-rester-attentif-a-ses-locuteurs>

- Radu Horaud was awarded an **ERC Advanced Grant** for his five year project VHIA “*Vision and Hearing in Action*”, grant number 340113, 2014-2019.

Website: <https://team.inria.fr/perception/vhia/>.

- The PERCEPTION team was awarded an **ANR BLANC** two year project MIXCAM “*Real-Time Visual Reconstruction by Mixing Multiple Depth and Color Cameras*”, in collaboration with 4D View Solutions, 2014-2016.

Website: <https://team.inria.fr/perception/mixcam-project/>

- The PERCEPTION team was awarded an **FP7 STREP** three year project EARS “*Embodied Audition for Robots*”, in collaboration with Friedrich Alexander Universiteit, coordinator (Germany), Ben Gurion University (Israel), Imperial College (UK), Humboldt University Berlin (Germany) and Aldebaran Robotics (France), 2014-2017.

Website: <https://team.inria.fr/perception/ears/>

PRIMA Project-Team

5.1. Highlights of the Year

On March 14, 2014, James Crowley was named Chevalier de l'Ordre national du Mérite.

On August 2014, the paper "Human-Robot Motion: an Attention-Based Navigation Approach" [14] by Thierry Fraichard, Remi Paulin & Patrick Reignier has been nominated for the best paper award at the IEEE Int. Symp. on Robot and Human Interactive Communication (RO-MAN 2014), Edinburgh (UK).

On December 2014, Patrick Reignier was a member of the EDF grand jury for smart energy

BEST PAPER AWARD :

[14] **IEEE Int. Symp. on Robot and Human Interactive Communication (ROMAN)**. T. FRAICHARD, R. PAULIN, P. REIGNIER.