Activity Report 2011

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ARENaire Project-Team

2.2. Highlights

Best Paper Award:

2.4. Highlights

The year 2011 was marked by strong financial difficulties due to the unilateral decision of the government to stop all Nano2012 fundings. For Compsys, involved in the Mediacom and S2S4HLS projects, this has led to a non-anticipated budget cut of about 60% (excluding salaries). The help of Inria to support the salary of Florian Brandner (post-doc/engineer) and pay some registration fees (in particular CGO’11) was crucial. The research activities in Mediacom still continue, but in a restricted form, until the end of Quentin Colombet’s PhD. However, Compsys had to stop its participation to S2S4HLS.

Compsys continued its activities on static single assignment (SSA) and register allocation, as well as on high-level synthesis (HLS) for FPGA. The main achievements in 2011 are:

- The design of a tree-scan allocator was continued and two related contributions were published at SCOPES’11 and CASES’11.
- Our new algorithm for liveness analysis under SSA and a comparison with existing methods were finalized and published at APLAS’11.
- An analysis, based on an integer linear programming formulation, of “optimal spilling” was made with full experiments and published at CASES’11.
- The automatic generation of double-buffered pipelined versions of computation kernels for FPGA was improved and will be presented at PPoPP’12. A simplifier for Boolean affine formulas was designed that should improve the code generation part.
- Alexandru Plesco, following his PhD, initiated a project of start-up, Zettice, supported by Inria and ENS-Lyon, combining the experience of Compsys on compilation and HLS, and the expertise of Arénaire on floating-point pipelined operators for FPGA. A publication at ARC’11 illustrates this effort.

Also, in 2011, Compsys was very active in the organization of important events for our scientific community:

- Fabrice Rastello, after re-activating the french community in compilation, was very involved in the organization of the main international conference in code generation (CGO’11), in Chamonix, and the organization and advertising of its workshops.
- Christophe Alias was the main organizer of IMPACT’11 (international workshop on polyhedral compilation techniques), held in conjunction with CGO’11. This workshop is the very first international event on this topic. Laure Gonnord was co-organizer of the workshop ACCA’11 (analyze to compile, compile to analyze), also part of CGO’11.

Best Paper Award:

LICT Exploratory Action

2.2. Highlights

The main results of the year concern both the aforementioned research and networking objectives:

- Integration of technical and legal requirements in a common framework to reduce legal uncertainties in software liability [5].
- Definition of a formal language for the specification of obligations and a posteriori verification of legal rules [10].
- Co-organization of a multidisciplinary conference on digital evidence (Palais de Justice de Paris, 8 December 2011) ¹.
- Organization of a multidisciplinary workshop on legal and technical aspects of causality (ENSCP Paris, 7 December 2011) ².
- Co-organization of the CPDP Conference and panel on “behavioural targeting” ³. CPDP, which is now established as the main privacy conference in Europe, attracts every year a wider and more multidisciplinary audience (more than 300 participants in 2011).

¹http://licit.inrialpes.fr/lise/
²http://licit.inrialpes.fr/lise/
³http://www.cpdpconferences.org
POP ART Project-Team (section vide)
2.2. Highlights

In 2011, Hubert Garavel received the prestigious Humboldt Research Award granted by the Alexander von Humboldt foundation (Bonn, Germany).
BIPOP Project-Team (section vide)
2.2. Highlights

2.2.1. Outstanding paper award at ICMI’11

Our article "Finding Audio-Visual Events in Informal Social Gatherings" [21] received the "Outstanding Paper Award" (best paper) at the IEEE/ACM 13th International Conference on Multimodal Interaction (ICMI), Alicante, Spain, November 2011. The paper is co-authored by members of both PERCEPTION and MISTIS, Xavi Alameda-Pineda, Vasil Khalidov, Radu Horaud and Florence Forbes. The paper addresses the problem of detecting and localizing audio-visual events (such as people) in a complex/cluttered scenario such as a cocktail party. The work is carried out within the collaborative European project HUMAVIPS.

BEST PAPER AWARD:

2.3. Highlights

We wish to highlight three results:

- **Interactive Quantum Chemistry**: we have developed what appears to be the first method for *interactive quantum chemistry*, at the ASED-MO level of theory. This should be of significant help to *e.g.* analyze and design nanosystems, as well as in chemistry education.

- **Adaptively Restrained Particle Simulations**: we have developed a rigorous method for adaptive simulation of particle systems, with potential applications in many areas of nanoscience, and beyond (particle simulations are widely used in *e.g.* computational fluid dynamics, astrophysics, computer graphics, etc.). The method has numerous advantages, and allows for the first time to rigorously and smoothly trade between precision and cost when performing a particle simulation.

- **ANR PEPSI**: NANO-D obtained a new ANR grant, called PEPSI. The PEPSI project is coordinated by Sergei Grudinin from NANO-D, and is in collaboration with Dave Ritchie at Loria and Valentin Gordeliy at IBS (Grenoble). The goal of the PEPSI project is to develop new representations of 3D protein structures, in order to calculate protein interactions extremely efficiently.

More details are available below.
NECS Project-Team

2.2. Highlights

The most relevant events and activities for the NeCS team in 2011 are the following:

- The organization of the 3rd annual Consortium Meeting of the FeedNetBack European project, held at INRIA in Montbonnot, on October 11-12th 2011. A review meeting session and scientific presentations from peoples involved in the FeedNetBack project have been organized.
- The recruitment of a new researcher in the team: Hassen Fourati has joined the NeCS team as an UJF Associate Professor (Maître de Conférences), since September 2011.
- During 2011, the NeCS team published 28 communications in national and international conferences, 8 papers in international journals, 1 scientific book chapter, 11 research reports and 1 patent.
2.3. Highlights

Our activity in road traffic modeling is reinforced by the doctoral thesis of M. L. Delle Monache, started in October.

Our collaboration with the SME K-Epsilon is fostered by two new contracts in the area of naval research (see Section 7.2).
BAMBOO Team

2.1. Highlights

There are two highlights we wish to stress for 2011. One is scientific and relates to contributions we made this year to the problems of intra- and inter-chromosomal interactions. The other highlight is both scientific and organisational. It concerns the setting up of an INRIA International Partnership with our close collaborators in Italy and the Netherlands.

2.1.1. Intra- and inter-chromosomal interactions

This year, we were able to make two contributions which both rely on the use of recently published data of 3D co-localisation of DNA fragments in human cells. In both cases, our findings are novel and broaden our view of what is a gene and what drives its (change of) location on the genome.

On the one hand, from the joint study of the network of spatial proximities of human genomic loci and a dataset of evolutionary breakpoints between human and mouse, we were able to provide evidence that evolutionary breakpoints tend to cluster spatially in human cells, which leads us to propose the new notion of spatial synteny, which generalises the widely used concept of genomic synteny.

On the other hand, in the framework of the extension of the ENCODE project to chromosome 21 and 22, we had the opportunity to identify a new category of transcripts, which we call chimeric transcripts. These transcripts contain exons from different genes, which can themselves be located far apart on the same chromosome, or on different chromosomes. We further found that the network formed by these connected genes is enriched in cliques of sizes 3 and 4, which seems to indicate that transcription and/or splicing of these sets of genes co-occur in time and space, as is confirmed by the confrontation of our expression dataset to a dataset indicating the co-localisation of DNA fragments in 3D.

2.1.2. INRIA International Partner: AMICI

The INRIA International Partner project AMICI is the continuation and extension of the INRIA Associated Team SIMBIOSI that started in January 2009 and ended in December 2011 (see the web page for SIMBIOSI at http://pbil.univ-lyon1.fr/members/sagot/htdocs/team/projects/simbiosi/simbiosi.html). It includes, beside the EPI, four partners: University of Rome La Sapienza, group headed by Alberto Marchetti-Spaccamela; Free University of Amsterdam and CWI, group headed by Leen Stougie; University of Florence, group headed by Pierluigi Crescenzi; University of Pisa, group headed by Nadia Pisanti. More information on AMICI may be found at http://piluc.dsi.unifi.it/amici.
Beagle Team (section vide)
2.3. Highlights

The year 2011 was marked by the following events:

- The edition of 6 volumes of the journal MMNP (Mathematical Modelling of Natural Phenomena) on
  the following topics: Instability and patterns (dedicated to A. Golovin), Modelling of plant growth,
  Computational aerodynamics, Granular hydrodynamics, Complex fluids, Biomathematics Education
  (for more details see http://www.mmnp-journal.org/action/displayJournal?jid=MNP).

- The co-organization of a monthly seminar (INRIabcd, every last friday), jointly with INRIA team
  BEAGLE, and the organization of a seminar on biomathematics (on thursday, twice a month).

- Organization of the international conference "Chance at the heart of the cell" (http://cgphimc.univ-
  lyon1.fr/CGPHIMC/CHC2), Lyon, 21-23 november 2011.
2.2. Highlights

Sara Berthoumieux, PhD student in IBIS, received the Ian Lawson Van Toch Memorial Award for the best student paper presented at the major bioinformatics conference ISMB/ECCB 2011. The paper of Sara, "Identification of metabolic network models from incomplete high-throughput datasets", has been published in the special ISMB/ECCB issue of *Bioinformatics*. An interview in which she explains her work can be found at [http://www.inria.fr/centre/grenoble/actualites/estimation-de-parametres-et-donnees-biologiques-incompletes](http://www.inria.fr/centre/grenoble/actualites/estimation-de-parametres-et-donnees-biologiques-incompletes).

Several members of IBIS were involved in the supervision of the student team from Grenoble that participated in the iGEM 2011 competition. Their project "Mercuro-Coli: A new way to quantify heavy metals", won a gold medal at the iGEM regional jamboree in Amsterdam and qualified for the world jamboree that was held in Boston in December 2011. More information on the iGEM project can be found at [http://www.inria.fr/centre/grenoble/actualites/une-bacterie-de-synthese-pour-doser-le-mercure](http://www.inria.fr/centre/grenoble/actualites/une-bacterie-de-synthese-pour-doser-le-mercure).

MOISE Project-Team

2.2. Highlights

F.-X. Le Dimet was elected Fellow of the American Meteorological Society (October 2011).
NUMED Project-Team (section vide)
STEEP Exploratory Action (section vide)
AMAZONES Team (section vide)
DNET Team

2.2. Highlights

2.2.1. HiKoB
Guillaume Chelius is a founder of the HiKoB company, created the 4th of July 2011, an innovative startup in the field of sensor networking and embedded communicating measure. HiKoB employs 3 persons by the end of 2011.

2.2.2. Fellows
DNET conducts theoretical and experimental research on social networks. In order to gain a better understanding of their structure and the dynamics of information diffusion on such networks, and validate the notion of cohesion of a group of nodes ('friends in the Facebook language) we launched Fellows an experimentation on Facebook. We introduce a novel way to automatically generate groups of friends, using only the information on “who knows who” within a user’s Facebook friends. By analyzing her/him Facebook connections, we are able to compute several groups/communities of friends. The user is able to create instantly corresponding Friend Lists on Facebook, and therefore have a better control on the diffusion of his/her publications.

2.2.3. Equipex FIT (Futur Internet of Things)
FIT is one of 52 winning projects in the Equipex research grant program. It will set up a competitive and innovative experimental facility that brings France to the forefront of Future Internet research. FIT benefits from 5.8€ million grant from the French government Running from 22.02.11 – 31.12.2019. The main ambition is to create a first-class facility to promote experimentally driven research and to facilitate the emergence of the Internet of the future. FIT is a joint project between UPMC, CNRS, INRIA, Telecom, LSIIT. It will be composed of distributed facility, heterogeneous devices, complementary components and be made of a Network Operations Center, a Cognitive Radio Tesbed, several Embedded Communication Objects Testbed that will upgrade and extend the existing SensLAB sites and several Wireless OneLab Testbed.

Best Papers Awards:
GRAAL Project-Team

2.2. Highlights

- Mathias Jacquelin, best poster award, IPDPS 2011 PhD forum.
- In 2011, we designed and developed the SpeQuIoS middleware, which is dedicated to provide Quality of Service to Best-Effort Distributed Computing Infrastructure. SpeQuIoS run now in production at IN2P3/University Paris XI and is being deployed on the European Desktop Grid Infrastructure. Simon Delamare won the best presentation award at the Grid’5000 Spring school.
2.3. Highlights

- Brigitte Plateau was nominated “Chevalier de la légion d’honneur” for her remarkable scientific contributions and her dedication to the influence of Grenoble in the scientific community.
- Derrick Kondo was the recipient of a Google award in 2011 for his work on the prediction of idleness in data-centers.
- Bruno Gaujal, Gaël Gorgo and Jean-Marc Vincent received the best paper award at the ASMTA conference (see Section 6.1 for a detailed account of their contribution).
- The software RTaW-Pegase has received the "Best Tool Demo Award" at the workshop "RTSS@work" at the RTSS conference. This tool is being developed by RTaW, a Start-up company of Inria Lorraine with consulting contributions by Bruno Gaujal.

BEST PAPER AWARD :
[37] 18th International Conference on Analytical and Stochastic Modelling Techniques and Applications (ASMTA’11). B. GAUJAL, G. GORGO, J.-M. VINCENT.
MOAIS Project-Team

2.2. Highlights

- Denis Trystram received the Google Research Award for his contributions within Moais on efficient management of distributed resources and multicriteria scheduling on emerging parallel platforms.
2.2. Highlights

- Our work on “tracking Skype users mobility” received a lot of media attention this year (tens of articles in Le Monde, The New York Times, Slashdot, The Register, and more generally in international technical and general audience press...). This work has been published in IMC 2011[46].

- Our work on “usernames uniqueness and traceability” has been published in PETS 2011 [47], one of the most prestigious conference in the area of Computer Privacy, and has been awarded the Andreas Pfitzmann award for the best contribution. It also received a lot of media attention.

- Our LDPC-Staircase codes have been included this year as the primary AL-FEC (Application Layer Forward Erasure Correction code) solution for ISDB-Tmm (Integrated Services Digital Broadcasting, Terrestrial Mobile Multimedia), a Japanese standard for digital television (DTV) and digital radio. The commercial launch of ISDB-Tmm will happen in mid 2012. This success has been made possible, on the one hand, by major efforts in terms of standardization within IETF and on the other hand, by our efforts in terms of design and evaluation of two efficient software codecs of LDPC-Staircase codes. The fact that LDPC-Staircase codes have been preferred to a major AL-FEC competitor for the ISDB-Tmm standard, is the recognition of their intrinsic qualities and of an appropriate balance between several technical and non technical criteria. See new results section for more details.

- We participate to The FIT project, one of 52 winning projects from the first wave of the French Ministry of Higher Education and Research’s “Équipements d’Excellence” (Equipex) research grant programme. This 8-year project started in 2011 and will benefit from a 5.8 million euro grant from the French government. Its aims is to develop an experimental facility, a federated and competitive infrastructure with international visibility and a broad panel of customers. In the context of this project, are building a federated wireless testbed platform. See also http://fit-equipex.fr/.
RESO Project-Team

2.2. Highlights

- Three PhD students from RESO defended their work in 2011: Fabienne Anhalt (July 2011), Guilherme Koslovski (July 2011) and Anne-Cécile Orgerie (Sept. 2011).
- RESO was granted 2 new projects in 2011:
  - ANR Fetuses (start Jan 1, 2012)
  - FSN Magellan (kick-off December 2011, start February 2012)
SARDES Project-Team (section vide)
SWING Team

2.2. Highlights

CorTex Equipex FIT: cognitive radio testbed \(^2\) FIT (Futur Internet of Things) is one of 52 winning projects in the Equipex research grant program. It will set up a competitive and innovative experimental facility that brings France to the forefront of Future Internet research. FIT is a joint project between UPMC, CNRS, INRIA, Telecom, LSIIT. It will be composed of distributed facility, heterogeneous devices, complementary components and be made of a Network Operations Center, a Cognitive Radio Testbed, several Embedded Communication Objects Testbed that will upgrade and extend the existing SensLAB sites and several Wireless OneLab Testbed. Swing leads the deployment of the Cognitive Radio Testbed located at INSA Lyon, which will offer a multi-hops PHY layer level testbed for testing cooperative communications, cognitive radio and software radio architectures.

wiplan: Indoor wireless networks planning \(^3\) Swing has been developing an original Indoor propagation simulation tool for 10 years. This propagation engine is extended to more complex environments within the iPLAN European project in cooperation with University of Bedfordshire, University of Sheffield and Ranplan Ltd (UK) to develop a premium Indoor wireless networks planning tool. During the coming year, this propagation engine will be connected to NS-3 in the framework of the ADT Mobsim.

TAPASCologne project: vehicular mobility dataset \(^4\) Swing has generated a large-scale urban vehicular mobility dataset, built on data made available the Institute of Transportation Systems at the German Aerospace Center (ITS-DLR). The synthetic mobility trace faithfully reproduce car traffic in the city of Cologne, Germany, covering a region of 400 square kilometers for a period of 24 hours, comprising more than 700,000 individual car trips. The dataset is a significant step forward in the simulation of vehicular mobility for network research and practitioners.

\(^2\)http://sdr-fit.project.citi-lab.fr/
\(^3\)http://wiplan.citi.insa-lyon.fr/
\(^4\)http://kolntrace.project.citi-lab.fr/
ARTIS Project-Team (section vide)
E-MOTION Project-Team

2.2. Highlights

- Renewing of the long-term agreement with Toyota (4 years) for common R&D studies in the field of Advanced Driver Assistance Systems. In the scope of this agreement, Toyota has lend an experimental equipped Lexus vehicle. A new PhD thesis focusing on this topic was launched.
- C. Laugier is in charge, since January 2010, of the scientific relations with Asia-Pacific at the INRIA office of International Relations. He is also member of the several committees at the French Ministry of Research (MESR) and at the French Ministry of Foreign Affairs (MAEE).
- A patent with Toyota signed in 2010 was extended to the USA.
- C. Laugier has given an invited talk at the conference IV’11 and a workshop at IROS’11.
- Several Contracts were accepted: ict-asia PAMM, ict-asia PREDIMAP, ANR Blanc International...
- C. Laugier was Editor at IEEE ICRA conference Editorial Board (CEB).
- C. Laugier was co-chair for workshop and tutorial at the IEEE/RSJ IROS 2011 conference in San Francisco.
- C. Laugier will be program co-chair for the IEEE/RSJ IROS 2012 conference.
EVASION Project-Team

2.2. Highlights

- European Research Council (ERC) advance grant 2011, Marie-Paule Cani.
- Eurographics Outstanding Technical Contributions Award 2011, Marie-Paule Cani.
- Papers accepted at TOG [3], [4], and SPM [2].
- The Hand Navigator was presented at cité de la Vilette as part of Fête de la science.
- Aestem Studio and Hand Navigator were presented at Experimenta, Salon de la Biennale Arts et Sciences, organized by CEA-LETI and Theatre de l’Hexagone in Grenoble.
EXMO Project-Team (section vide)
2.2. Highlights

- **Action recognition.** LEAR has developed several successful methods for action recognition [7], [11], [18]. Our approach for action recognition in still images automatically determines objects relevant for an action given a set of training images [7]. In the PASCAL visual object classes challenge 2011 it achieved best results on three out of ten action classes and the best result on average over all classes.

  The approaches [11], [18] model the dynamics of actions in videos. In [18] dense trajectory descriptors are extracted and shown to outperform existing video descriptors. In [11] an “actom sequence model” is introduced, which decomposes actions into sequences of (overlapping) action-units called “actoms”. Each actom gathers temporally localized discriminative visual features of the action. This actom sequence model outperformed state-of-the-art approaches on the “Coffee and cigarettes” dataset.

- **Large-scale classification.** LEAR has designed an efficient and scalable approach for large-scale image classification. The approach [10] allows to gracefully scale up to large number of categories and examples while learning the underlying taxonomy of the categories at the same time, by using a trace-norm regularization penalty. Promising experimental results on subsets of the ImageNet dataset were obtained, where our method outperforms state-of-the-art approaches using 16-Gaussian Fisher vectors. A spatial extension of Fisher vectors [15] allows dimensionality reduction, as does the compression technique presented in [5].

- **INRIA Visual Recognition and Machine Learning Summer School.** This year we co-organized the second edition of the ENS-INRIA Visual Recognition and Machine Learning Summer School in Paris. It attracted a total of 175 participants (31% from France, 50% from Europe and 20% from America and Asia). Next year the summer school will again be organized in Grenoble.
2.2. Highlights

2.2.1. Creation

The Morpheo team was created in March 2011.

2.2.2. Morpho – Analysis of Human Shapes and Motions

The ANR project Morpho is coordinated by Morpheo. This project is aimed at designing new technologies for the measure and for the analysis of dynamic surface evolutions using visual data. 3 academic partners will collaborate on this project: the INRIA Grenoble Rhône-Alpes with the Morpheo team, the GIPSA-lab Grenoble and the INRIA-Lorraine with the Alice team.

2.2.3. Collaboration with Technicolor

A collaboration between Morpheo and Technicolor has been initiated in 2011. The objective is to develop new gesture interfaces using visual inputs such as color and depth cameras. A co-supervised PhD started in May 2011 and technicolor and Morpheo are also collaborating on this subject within the Quaero project.
2.2. Highlights

2.2.1. The European project Humavips – Humanoids with Auditory and Visual Abilities in Populated Spaces

HUMAVIPS (http://humavips.inrialpes.fr) is a 36 months FP7 STREP project coordinated by Radu Horaud and which started in 2010. The project addresses multimodal perception and cognitive issues associated with the computational development of a social robot. The ambition is 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. Proposed research and technological developments will emphasize the role played by multimodal perception within principled models of human-robot interaction and of humanoid behavior.

2.2.2. Collaboration with SAMSUNG – 3D Capturing and Modeling from Scalable Camera Configurations

In 2010 started a 30 months collaboration with the Samsung Advanced Institute of Technology (SAIT), Seoul, Korea. Within this project we develop a methodology able to combine data from several types of visual sensors (2D high-definition color cameras and 3D range cameras) in order to reconstruct, in real-time, an indoor scene without any constraints in terms of background, illumination conditions, etc.

2.2.3. Outstanding paper award at ICMI’11

Our article "Finding Audio-Visual Events in Informal Social Gatherings" [29] received the "Outstanding Paper Award" (best paper) at the IEEE/ACM 13th International Conference on Multimodal Interaction (ICMI), Alicante, Spain, November 2011. The paper is co-authored by members of both PERCEPTION and MISTIS, Xavi Alameda-Pineda, Vasil Khalidov, Radu Horaud and Florence Forbes. The paper addresses the problem of detecting and localizing audio-visual events (such as people) in a complex/cluttered scenario such as a cocktail party. The work is carried out within the collaborative European project HUMAVIPS.
2.2. Highlights

- In January 2010, the research laboratories of the Grenoble Universities were evaluated by the French AERES evaluation agency. Within this context, each of the 24 research groups of the Laboratoire Informatique de Grenoble (LIG) were individually evaluated with respect to 4 criteria: Scientific Quality, Visibility, Governance, and Scientific Project, as well as overall activity. The results were labeled with a grade (A+, A, B, C). The PRIMA research group received an overall score of A+, and was on of only two research groups in Grenoble to receive a score of A+ in all four areas: Scientific Quality, Visibility, Governance, and Scientific Project.

- Members of the PRIMA group have coordinated the submission of the proposal AMIQUAL4HOME to the second round of funding for Equipment for Scientific Excellence (EQUIPEX) of the programme Investissement d'Avenir. AMIQUAL4HOME has been ranked 45 of the 270 proposals submitted and is listed among the Laureat of the 2011 Equipex programme.

- PRIMA director James Crowley has been named as a senior member of the Institut Universitaire de France (IUF) with a research programme entitled "Perception for Social Interaction".
WAM Project-Team (section vide)