RESEARCH CENTER
Sophia Antipolis - Méditerranée

FIELD

Activity Report 2013

Section Partnerships and Cooperations

Edition: 2014-03-19

ABS Project-Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. Projets Exploratoires Pluridisciplinaires from CNRS/Inria/INSERM

Title: Modeling Large Protein Assemblies with Toleranced Models

Type: Projet Exploratoire Pluri-disciplinaire (PEPS) CNRS / Inria / INSERM

Duration: two years

Coordinator: F. Cazals (Inria, ABS)

Others partners: V.Doye (Inst. Jacques Monod)

Abstract: Reconstruction by Data Integration (RDI) is an emerging paradigm to reconstruct large protein assemblies, as discussed in section 5.1.3 .

Elaborating on our Toleranced Models framework, a geometric framework aiming at inherently accommodating uncertainties on the shapes and positions of proteins within large assemblies, we ambition within the scope of the two year long PEPS project entitled *Modeling Large Protein Assemblies with Toleranced Models* to (i) design TOM compatible with the flexibility of proteins, (ii) develop graph-based analysis of TOM, and (iii) perform experimental validations on the NPC.

7.2. European Initiatives

7.2.1. FP7 Projects

7.2.1.1. CG-Learning

Title: Computational Geometric Learning (CGL)

Type: COOPERATION (ICT)

Defi: FET Open

Instrument: Specific Targeted Research Project (STREP)

Duration: November 2010 - October 2013

Coordinator: Friedrich-Schiller-Universität Jena (Germany)

Others partners: Jena Univ. (coord.), Inria (Geometrica Sophia, Geometrica Saclay, ABS), Tech. Univ. of Dortmund, Tel Aviv Univ., Nat. Univ. of Athens, Univ. of Groningen, ETH Zürich, Freie Univ. Berlin.

See also: http://cglearning.eu/

Abstract: *The Computational Geometric Learning project aims at extending the success story of geometric algorithms with guarantees to high-dimensions. This is not a straightforward task. For many problems, no efficient algorithms exist that compute the exact solution in high dimensions. This behavior is commonly called the curse of dimensionality. We try to address the curse of dimensionality by focusing on inherent structure in the data like sparsity or low intrinsic dimension, and by resorting to fast approximation algorithms.*

7.3. International Initiatives

7.3.1. Inria International Partners

7.3.1.1. Declared Inria International Partners

ABS has regular international collaboration, in particular with the members of the FP7 project *Computational geometric learning* mentioned in section 7.2.1 .

7.4. International Research Visitors

7.4.1. Internships

- Angeliki Kalamara, from the University of Athens, performed a 5 month internship under the dual supervision of F. Cazals and I. Emiris (Univ. of Athens). The topic was *Modeling cryo-electron microscopy density maps*.

AOSTE Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. CIM PACA Design Platform

Participants: Robert de Simone, Ameni Khecharem, Carlos Gomez Cardenas, Emilien Kofman.

This ambitious regional initiative is intended to foster collaborations between local PACA industry and academia partners on the topics of microelectronic design, though mutualization of equipments, resources and R&D concerns. We are active in the Design Platform (one of three platforms), of which Inria is a founding member. This provides opportunities for interactions with local companies, leading indirectly to more formal collaborations at times. Phase 3 of the CIM PACA programme should be launched in 2014, and was subject of extensible preparation at the end of 2013.

The ANR HOPE project 8.2.1.2 is conducted under the auspices of the CIM PACA Design Platform, which also hosts prototype and commercial software products contributed by project members (Synopsys, Docea Power, and Magillem, see 8.2.1.2). Similarly, the CLISTINE FUI project was recently accepted, and supported by the platform.

8.2. National Initiatives

8.2.1. ANR

8.2.1.1. HeLP

Participants: Carlos Gomez Cardenas, Ameni Khecharem, Robert de Simone, Jean-Vivien Millo.

The ANR HeLP project dealt with joint modeling of functional behavior and energy consumption for the design of low-power heterogeneous SoCs. Partners were ST Microelectronics and Docea Power (SME) as industrial; Inria, UNS (UMR LEAT), and VERIMAG (coordinator) as academics. Our goal in this project was twofold: first, combine SoC modeling with temporal behavior and logical time with energy/power modeling as extra annotations on MARTE models; second, link the modeling abilities of MARTE with those of the domain-specific standard IP-XACT.

The project ended in April 2013, with some of its findings taken up and extended in the more recent ANR project HOPE.

8.2.1.2. HOPE

Participants: Carlos Gomez Cardenas, Ameni Khecharem, Emilien Kofman, Robert de Simone.

The ANR HOPE project focuses on hierarchical aspects for the high-level modeling and early estimation of power management techniques, with potential synthesis in the end if feasible.
The PhD defense of Carlos Gomez Cardenas was held in Dec 2013 [16], in strong connection with the project (as a follow-up of HeLP).
Although this project was officially started in November, it was in part postponed due to the replacement of a major partner (Texas Instruments) by another one (Intel). Current partners are CNRS/UNS UMR LEAT, Intel, Synopsys, Docea Power, Magillem, and ourselves.

8.2.1.3. GeMoC

Participants: Matias Vara Larsen, Julien Deantoni, Frédéric Mallet.

This project is admistratively handled by CNRS for our joint team, on the UMR I3S side. Partners are Inria (Triskell EPI), ENSTA-Bretagne, IRIT, Obeo, Thales TRT.

The project focuses on the modeling of heterogeneous systems using Models of Computation and Communication for embedded and real-time systems, described using generic means of MDE techniques (and in our case the MARTE profile, and most specifically its Time Model, which allows to specify precise timely constraints for operational semantic definition).

8.2.2. FUI

8.2.2.1. FUI P

Participants: Abderraouf Benyahia, Dumitru Potop Butucaru, Yves Sorel.

The goal of project P is to support the model-driven engineering of high-integrity embedded real-time systems by providing an open code generation framework able to verify the semantic consistency of systems described using safe subsets of heterogeneous modeling languages, then to generate optimized source code for multiple programming (Ada, C/C++) and synthesis (VHDL, SystemC) languages, and finally to support a multi-domain (avionics, space, and automotive) certification process by providing open qualification material. Modeling languages range from behavioural to architectural languages and present a synchronous and asynchronous semantics (Simulink/Matlab, Scicos, Xcos, SysML, MARTE, UML),
See also: http://www.open-do.org/projects/p/
Partners of the project are: industrial partners (Airbus, Astrium, Continental, Rockwell Collins, Safran, Thales), SMEs (AdaCore, Altair, Scilab Enterprise, STI), service companies (ACG, Aboard Engineering, Atos Origins) and research centers (CNRS, ENPC, Inria, ONERA).

8.2.2.2. FUI PARSEC

Participants: Dumitru Potop Butucaru, Thomas Carle, Zhen Zhang, Yves Sorel.

The PARSEC Project aims at providing development tools for critical real-time distributed systems requiring certification according to the most stringent standards such as DO-178B (avionics), IEC 61508 (transportation) or Common Criteria for Information Technology Security Evaluation. The approach proposed by PARSEC provides an integrated toolset that helps software engineers to meet the requirements associated to the certification of critical embedded software. Partners of the project are: Alstom, Thales, Ellidiss, OpenWide, Systerel, CEA, InriaS, Telecom ParisTech.
See also: http://www.systematic-paris-region.org/sites/default/files/exports/projets/fichiers/ProjetPARSEC_BookSystematic2012.pdf.

8.2.2.3. FUI CLISTINE

Participants: Robert de Simone, Amin Oueslati, Emilien Kofman.

This contract has just been accepted, with a kick-off meeting in Dec 2013. Partners are SynergieCAD (coordinator), Avantis, Optis, and the two EPIs Aoste and Nachos. The goal is to study the feasibility of building a low-cost, low-power "supercomputer", reusing ideas from SoC design, but this time with out-of-chip network "on-board", and out-of-the-shelf processor elements organized as an array. The network itself should be time predictable and highly parallel (far more than PCI-e for instance).

8.2.3. Investissements d'Avenir

8.2.3.1. DEPARTS

Participants: Liliana Cucu-Grosjean, Adriana Gogonel, Codé Lo, Cristian Maxim.

This project is funded by the BGLE Call (*Briques Logicielles pour le Logiciel Embarqué* of the national support programme *Investissements d'Avenir*. Formally started on October 1st, 2012, but the kick-off meeting was only held on April, 2013 for administrative reasons. Initially this contract was handled by the TRIO team in Nancy, but at this end of TRIO moved to Aoste Rocquencourt with the people involved. Research will target solutions for probabilistic component-based models, and a Ph.D. thesis will start early 2014 on this topic. The goal is to allow designers to unify in a common framework probabilistic scheduling techniques with compositional assume/guarantee contracts that have different levels of criticality. Our contribution is based on the schedulability analysis presented in [39].

8.3. European Initiatives

8.3.1. FP7 Projects

8.3.1.1. PROXIMA

Participants: Liliana Cucu-Grosjean, Adriana Gogonel, Codé Lo, Cristian Maxim.

Type: COOPERATION
Defi: Mixed-Criticality Systems
Instrument: Integrated Project
Objectif: Development of probabilistic approaches for mixed-criticality systems on multi-core and many-core platforms
Duration: October 2013 - September 2016
Coordinator: Barcelona Supercomputing Center (Spain)
Inria contact: Liliana Cucu-Grosjean PROXIMA started on October 1st, 2013 with a kick-off meeting in November 2013.

The project claims that probabilistic analysis techniques can provide efficient (tractable) and effective (tight) analysis of the temporal behaviour of complex mixed-criticality applications, while running on novel multicore and manycore platforms. Solid research results from the former FP7 STREP PROARTIS project sustain this claim. The concept is based on using probabilistic analysis techniques to derive safe and tight bounds on the temporal behaviour of applications,. Such bounds should reflect requirements on failure rates commensurate with their criticality.
PROXIMA defines architectural paradigms that break causal dependence in the timing behaviour of execution components at hardware and software level that can give rise to pathological cases. The risk is then reduced to quantifiably small levels. The changes needed in the hardware and software components beneath the application (processing cores, interconnects, memory hierarchies and controllers, real-time operating system, middleware, compilers) remain modest.

8.3.2. Collaborations in European Programs, except FP7

8.3.2.1. ARTEMIS PRESTO

Participants: Frédéric Mallet, Arda Goknil, Julien Deantoni, Marie-Agnès Peraldi Frati, Robert de Simone, Jean-Vivien Millo.

Type: ARTEMIS
Project title: PRESTO
Duration: April 2011 - March 2014
Coordinator: Miltech (Greece)
Others partners: TELETEL S.A. (Greece), THALES Communications (France), Rapita Systems Ltd. (United Kingdom), VTT (Finland), Softeam (France), THALES (Italy), MetaCase (Finland), Inria (France), University of LâAquila (Italy), MILTECH HELLAS S.A (Greece), PragmaDev (France), Prismtech (United Kingdom), Sarokal Solutions (Finland).
See also: http://www.cesarproject.eu/
Abstract: The PRESTO project aims at improving test-based embedded systems development and validation, while considering the constraints of industrial development processes. This project is based on the integration of test traces exploitation, along with platform models and design space exploration techniques. Such traces are obtained by execution of test patterns, during the software integration design phase, meant to validate system requirements. The expected result of the project is to establish functional and performance analysis and platform optimisation at early stage of the design development. The approach of PRESTO is to model the software/hardware allocation, by the use of modelling frameworks, such as the UML profile for model-driven development of Real Time and Embedded Systems (MARTE). The analysis tools, among them timing analysis including Worst Case Execution Time (WCET) analysis, scheduling analysis and possibly more abstract system-level timing analysis techniques will receive as inputs on the one hand information from the performance modelling of the HW/SW-platform, and on the other hand behavioural information of the software design from tests results of the integration test execution.

8.4. International Initiatives

8.4.1. Inria Associate Teams

8.4.1.1. DAESD

Title: Distributed/Asynchronous and Embedded/synchronous Systems Development

Inria principal investigator: Robert de Simone (Aoste) / Eric Madelaine (Oasis)

International Partner (Institution - Laboratory - Researcher):

East China Normal University (China) - SEI-Shone - Robert De Simone

Duration: 2012 - 2014

See also: https://team.inria.fr/DAESD/

The development of concurrent and parallel systems has traditionally been clearly split in two different families: distributed and asynchronous systems on one hand, now growing very fast with the recent progress of the Internet towards large scale services and clouds; embedded, reactive, or hybrid systems on the other hand, mostly of synchronous behaviour. The frontier between these families has attracted less attention, but recent trends, e.g. in industrial systems, in Cyber-Physical systems (CPS), or in the emerging Internet of Things, give a new importance to research combining them.
The aim of the DAESD associate team is to combine the expertise of the Oasis and Aoste teams at Inria, the SEI-Shone team at ECNU-Shanghai, and to build models, methods, and prototype software tools inheriting from synchronous and asynchronous models. We plan to address modelling formalisms and tools, for this combined model; to establish a method to analyze temporal and spatial consistency of embedded distributed real-time systems; to develop scheduling strategies for multiple tasks in embedded and distributed systems with mixed constraints.
A dedicated Spring School was organized this year in Shanghai (April 27-30th), with participation of Robert de Simone and Frédéric Mallet from Aoste.

8.4.2. Inria International Labs

8.4.2.1. LIAMA

The DAESD associated-team goals have been extended to a LIAMA project named HADES (Heterogeneous Asynchronous Distributed / Embedded Synchronous), again with the SEI-Shone lab of ECNU Shanghai. The kick-off meeting was held next to the thematic Spring School (see 8.4.1.1), in presence of Chinese and French officials.

8.5. International Research Visitors

8.5.1. Visits of International Scientists

8.5.1.1. Internships

Franco Pestarini

Subject: Threads scheduling on multicore processors

Date: from Feb 2013 until Jul 2013

Institution: Universidad National de Rosario (Argentina)

APICS Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR

The ANR (Astrid) project COCORAM (Co-design et co-intégration de réseaux d'antennes actives multi-bandes pour systèmes de radionavigation par satellite) has been accepted and will officially start January 2014. We are associated in this project with three other teams from XLIM (Limoges University), specialized respectively on filters, antennas and amplifiers. The core idea of the project is to work on the co-integration of various microwave devices in the context of GPS satellite systems and in particular for us to work on matching problems (see Section 6.3.1).

8.2. European Initiatives

8.2.1. Collaborations with Major European Organizations

APICS is part of the European Research Network on System Identification (ERNSI) since 1992.

Subject: System identification concerns the construction, estimation and validation of mathematical models of dynamical physical or engineering phenomena from experimental data.

8.3. International Initiatives

8.3.1. Inria Associate Teams

8.3.1.1. IMPINGE

Title: Inverse Magnetization Problems IN GEosciences.

Inria principal investigator: Laurent Baratchart

International Partner (Institution - Laboratory - Researcher):

MIT - Department of Earth, Atmospheric and Planetary Sciences (United States) - Benjamin Weiss

Duration: 2013 - 2015

See details at : http://www-sop.inria.fr/apics/IMPINGE/

The purpose of the associate team IMPINGE is to develop efficient algorithms to recover the magnetization distribution of rock slabs from measurements of the magnetic field above the slab using a SQUID microscope (developed at MIT). The US team also involves a group at Vanderbilt Univ.

8.3.2. Inria International Partners

8.3.2.1. Declared Inria International Partners

NSF CMG collaborative research grant DMS/0934630, "Imaging magnetization distributions in geological samples", with Vanderbilt University and the MIT (USA).

Cyprus NF grant "Orthogonal polynomials in the complex plane: distribution of zeros, strong asymptotics and shape reconstruction".

PHC Utique CMCU (led by Fédération Denis Poisson, Univ. Orléans), "Harmonic analysis and applications".

8.3.2.2. Informal International Partners

As mentioned in Sections 5.6 and 6.1.1 , a cooperation with the German firm BESA [4] has started this year, which includes Athena Team (Inria Sophia-Antipolis-Méditerranée) and Centre de Mathématiques Appliquées of École des Mines de Paris. It is expected to be formalized soon, so as to include several developments of the software FindSources3D as well as a co-advised PhD.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

- Douglas Hardin (Vanderbilt University, Nashville, USA, Jun 2013)
- Matteo Oldoni (Siae Microelettronica, Milano, Italy, Nov 2013)
- Vladimir Peller (Michigan University, East Lansing, from May until Jun 2013)
- Yannick Privat (CNRS, Univ. P. et M. Curie, Paris, Dec 2013).
- Tao Qian (University of Macau, Taipa, China, Jul 2013)
- Edward Saff (Vanderbilt University, Nashville, USA, from May until Jun 2013)
- Michael Stessin (New York state University at Albany, USA, Jun 2013)
- Nikos Stylianopoulos (Univ. of Cyprus).
- Ian Sloan (University of New South Wales, Sydney, Australia, Jun. 2013).
- Maxim Yattselev (Indiana University–Purdue University, Indianapolis, USA, Mar 2013)

8.4.1.1. Internships

- K. Bashtova, Master 2 Mathmods - UNSA (6 months), Inverse source problems for elecromagnetic fields, with physical applications.

8.5. List of international and industrial partners

- Collaboration under contract with Thales Alenia Space (Toulouse, Cannes, and Paris), CNES (Toulouse), XLIM (Limoges), University of Bilbao (Universidad del País Vasco / Euskal Herriko Unibertsitatea, Spain).
- Regular contacts with research groups at UST (Villeneuve d'Asq), Universities of Bordeaux-I (Talence), Orléans (MAPMO), Aix-Marseille (CMI-LATP), Nice Sophia Antipolis (Lab. JAD), Grenoble (IJF and LJK), Paris 6 (P. et M. Curie, Lab. JLL), Paris Diderot (LAREG-IGN), CWI (the Netherlands), MIT (Boston, USA), Vanderbilt University (Nashville USA), Steklov Institute (Moscow), Michigan State University (East-Lansing, USA), Texas A&M University (College Station USA), State University of New-York (Albany, USA), University of Oregon (Eugene, USA), Politecnico di Milano (Milan, Italy), University of Trieste (Italy), RMC (Kingston, Canada), University of Leeds (UK), of Maastricht (The Netherlands), of Cork (Ireland), Vrije Universiteit Brussel (Belgium), TU-Wien (Austria), TFH-Berlin (Germany), ENIT (Tunis), KTH (Stockholm), University of Cyprus (Nicosia, Cyprus), University of Macau (Macau, China), BESA company (Munich), SIAE Microelettronica (Milano).
- The project is involved in the GDR-project AFHP (CNRS), in the ANR (Astrid program) project COCORAM (with XLIM, Limoges, and DGA), in a EMS21-RTG NSF program (with MIT, Boston, and Vanderbilt University, Nashville, USA), in the Associate Inria Team IMPINGE (with MIT, Boston), and in a CSF program (with University of Cyprus).

[4] http://www.besa.de/

ASCLEPIOS Project-Team

7. Partnerships and Cooperations

7.1. European Initiatives

7.1.1. FP7 Projects

7.1.1.1. VPH NOE

Participants: Maxime Sermesant [correspondant], Moulay Fadil, Florian Vichot, Nicholas Ayache.

medinria registration toolbox VPH NOE standards

Title: VPH NoE

Type: COOPERATION (ICT)

Defi: Virtual Physiological Man

Instrument: Network of Excellence (NoE)

Duration: June 2008 - November 2012

Coordinator: University College London, UK

Others partners: Core members include UCL (UK), Oxford (UK), CNRS (FR), ULB (BE), U. of Nottingham (UK), UPF (ES), U. Auckland (NZ), EMBL (DE), U. Sheffield (UK), Karolinka (SE), ERCIM (FR), IOR (IT).

See also: http://www.vph-noe.eu/

Abstract: The Virtual Physiological Human Network of Excellence (VPH NoE) is a EU seventh Framework funded project, working to connect and support researchers in the VPH field within Europe and beyond. Inria is one of the core members, and is mostly dedicated, through Asclepios, to the data fusion part of the VPH toolkit. More precisely, a registration toolbox has been delivered which aims at including registration algorithms from the team and elsewhere in the new version of medInria (2.x). During the extension of the project through 2013, we participated in a hackfest on software interoperability (May 20-24, 2013 in Kingston, Canada and Nov 4-8, 2013 in London, UK).

7.1.1.2. MedYMA

Title: Biophysical Modeling & Analysis of Dynamic Medical Images

Type:ERC

Instrument: ERC Advanced Grant (Advanced)

Duration: April 2012 - March 2017

Coordinator: Inria (France)

See also: http://www.inria.fr/en/centre/sophia/news/medical-imagery-and-i.t.-the-personalised-digital-patient

Abstract: During the past decades, exceptional progress was made with in vivo medical imaging technologies for capturing the anatomical, structural and physiological properties of tissues and organs in a patient, with an ever increasing spatial and temporal resolution. The physician is now faced with a formidable overflow of information, especially when a time dimension is added to the already hard to integrate 3-D spatial, multimodal and multiscale dimensions of modern medical images. This increasingly hampers the early detection and understanding of subtle image changes which can have a vital impact on the patient's health. To change this situation, this proposal introduces a new generation of computational models for the simulation and analysis of dynamic medical images. Thanks to their generative nature, they will allow the construction of databases

of synthetic, realistic medical image sequences simulating various evolving diseases, producing an invaluable new resource for training and benchmarking. Leveraging their principled biophysical and statistical foundations, these new models will bring remarkable added clinical value after they are personalized with innovative methods to fit the medical images of any specific patient. By explicitly revealing the underlying evolving biophysical processes observable in the images, this approach will yield new groundbreaking image processing tools to correctly interpret the patient's condition (computer aided diagnosis), to accurately predict future evolution (computer aided prognosis), and to precisely simulate and monitor an optimal and personalized therapeutic strategy (computer aided therapy). First applications will concern high impact diseases including brain tumors, Alzheimer's disease, heart failure and cardiac arrhythmia and will open new horizons in computational medical imaging.

7.1.1.3. MD PAEDIGREE

Type: COOPERATION

Defi: ICT for Health

Instrument: Integrated Project

Objectif: validating and advancing patient-specific, computer-based predictive models of six paediatric pathologies into clinical acceptance.

Duration: March 2013 - February 2017

Coordinator: Ospedale Pediatrico Bambino Gesu, Rome, Italy.

Partners: Siemens AG (DE), Siemens SCR (USA), Maat France (FR), MOTEK (NL), EMP (DE), VUmc (NL), Lynkeus (IT). Universities: KU Leuven (BE), Fraunhofer (DE), UMC Utrecht (NL), TU Delft(NL), Sheffield (UK), Athens (GR), Genoa (IT), Transilvania din Brasov (RO); Hospitals: OPBG (Roma, IT), Gaslini (Genoa, IT), GOSH/UCL (London, UK), JHU (Baltimore, USA).

See also: http://www.md-paedigree.eu/

Inria contact: Xavier Pennec

Abstract: MD-Paedigree is a clinically-driven and strongly VPH-rooted project, where 7 world-renowned clinical centres of excellence pursue improved interoperability of paediatric biomedical information, data and knowledge by developing together a set of reusable and adaptable multi-scale models for more predictive, individualised, effective and safer paediatric healthcare, being scientifically and technologically supported by one of the leading industrial actors in medical applications in Europe operating in conjunction with highly qualified SMEs and some of the most experienced research partners in the VPH community.

MD-Paedigree validates and brings to maturity patient-specific computer-based predictive models of various paediatric diseases, thus increasing their potential acceptance in the clinical and biomedical research environment by making them readily available not only in the form of sustainable models and simulations, but also as newly-defined workflows for personalised predictive medicine at the point of care. These tools can be accessed and used through an innovative model-driven infostructure powered by an established digital repository solution able to integrate multimodal health data, entirely focused on paediatrics and conceived of as a specific implementation of the VPH-Share project, planned to be fully interoperable with it and cooperating, through it, also with p-Medicine.

MD-Paedigree's goals are to integrate and share highly heterogeneous biomedical information, data and knowledge, using best practices from the biomedical semantic Web; develop holistic search strategies to seamlessly navigate through and manage the integrative model-driven infostructure and digital repository; jointly develop reusable, adaptable and composable multi-scale VPH workflow models, support evidence-based translational medicine at the point of care, and ultimately facilitate collaborations within the VPH community.

7.1.1.4. VP2HF

Type: COOPERATION

Defi: ICT for Health

Instrument: Specific Targeted Research Project

Objectif: New Patient Management for Heart Failure using Modelling

Duration: October 2013 - September 2016

Coordinator: King's College London (UK)

Partner: Philips Research Hamburg (DE), Universitat Pompeu Fabra (SP), Inria, French National Research Institute in Informatics and Mathematics (FR), Université Catholique de Louvain (BE), Caen University Hospital (FR), Philips Research Paris (FR), Simula Research Laboratory (NO), Centron Diagnostics (UK)

Inria contact: Dominique Chapelle

Abstract: Heart failure (HF) is one of the major health issues in Europe, affecting 6 million patients and growing substantially because of the ageing population and improving survival following myocardial infarction. The poor short to medium term prognosis of these patients means that treatments such as cardiac re-synchronisation therapy and mitral valve repair can have substantial impact. However, these therapies are ineffective in up to 50% of the treated patients and involve significant morbidity and substantial cost. The primary aim of VP2HF is to bring together image and data processing tools with statistical and integrated biophysical models mainly developed in previous VPH projects, into a single clinical workflow to improve therapy selection and treatment optimisation in HF. The tools will be tested and validated in 200 patients (including 50 historical datasets) across 3 clinical sites, including a prospective clinical study in 50 patients in the last year of the project. The key innovations in VP2HF that make it likely that the project results will be commercially exploited and have major clinical impact are: 1) all tools to process images and signals, and obtain the statistical and biophysical models will be integrated into one clinical software platform that can be easily and intuitively used by clinicians and tried out in the prospective clinical study; and 2) by utilising a decision tree stratification approach, only the appropriate parts of the tool chain, that will add maximum value to the predictions, will be used in individual patients, so that the more resource intensive parts will be used when they will add real value. We expect that the study results of substantial improved efficacy of decision making over current guidelines, and an integrated package that is used as part of clinical workflow will ensure the industrial project partners, in particular Philips, will develop project outputs into dedicated products that will have significant clinical impact.

7.1.2. Collaborations in European Programs, except FP7

7.1.2.1. Care4Me

Participants: Xavier Pennec [Correspondant], Nicholas Ayache, Hervé Delingette, Kristin Mcleod, Erin Stretton, Maxime Sermesant, Marco Lorenzi.

Program: ITEA2

Project acronym: Care4Me

Project title: Cooperative Advanced REsearch for Medical Efficiency

Duration: September 2009 - September 2013

Coordinator: Philips, NL.

Other partners: Alma (ES), Bull (FR), CEA (FR), CIMNE (ES), Compasiss (ES), CVSS (ES), Duodecim (FI), Erasmus MC (NL), ESI (NL), HSP (ES), Helsinki Hosp. (FI), ISI (GGR), LUMC (NL), MediConsult (FI), MEDIS (NL), Nokia (FI), Philips (NL), Pie Medical Imag. (NL), Pohjola (FI), Prowellness (FI), Robotiker (ES), UMC (NL), VTT (FI)

Abstract: This project aims at increasing quality and productivity in the healthcare care cycle by using more advanced medical imaging and decision support methods while combining them with different knowledge sources, from early diagnosis to treatment and monitoring. The final outcome of this project were clinical prototypes of novel medical image analysis and decision support systems for three specific disease areas (cancer, cardio-vascular and neurodegenerative diseases), that connect to hospital information systems using a new system architecture. In this project, the role of the Asclepios team is to develop an atlas of the ageing brain and the beating heart, and to model tumor growth.

7.2. International Initiatives

7.2.1. Inria Associate Teams

7.2.1.1. CAPNEONATES

Title: Analysis of structural MR and DTI in neonates

Inria principal investigator: Bertrand Thirion [Parietal]

Asclepios investigator: Xavier Pennec

International Partner (Institution - Laboratory - Researcher):

Institution: University of Southern California (United States)

Laboratory: Image Lab at Children Hospital at Los Angeles

Researcher: Natasha Leporé

Duration: 2011 - 2013

See also: http://www.capneonates.org/

While survival is possible at increasingly lower gestational ages at birth, premature babies are at higher risk of developing mental disorders or learning disabilities than babies born at term. A precise identification of the developmental differences between premature and control neonates is consequently of utmost importance. Nowadays, the continuously improving quality and availability of MR systems makes it possible to precisely determine, characterize and compare brain structures such as cortical regions, or white matter fiber bundles. The objective of this project is to understand the developmental differences between premature and normal neonates, using structural and diffusion MRI. This work consists in identifying, characterizing and meticulously studying the brain structures that are different between the two groups. To do so, we join forces with the Parietal team at Inria and the University of Southern California. Parietal has a recognized expertise in medical image registration and in statistical analyses of groups of individuals. USC has a broad knowledge in MR image processing. In particular, the Children's Hospital at Los Angeles (CHLA), which is part of USC, is in the process of collecting a unique database of several hundred MR scans of premature and normal neonates. This joint collaboration consequently offers a unique chance of addressing key questions pertaining to neonatal and premature development. It will make it possible to elaborate new tools for analyzing neonate MR images while tremendously increasing our knowledge of neuroanatomy at an early stage in life.

7.2.2. Inria International Partners

7.2.2.1. Declared Inria International Partners

7.2.2.1.1. Stanford, Statistics Department

France Stanford collaborative project grant (2013-2014):*Understanding Lower Back Pain through Geometric Statistical Analysis of computed tomography (CT) Images*. Stanford, Statistics Dept & Nice Univ. Hospital. Principal investigators X. Pennec (Inria) and S. Holmes (Stanford). Collaboration on statistics on group-valued trees and geometric subspace learning [55].

7.2.2.2. Collaboration with international hospitals

7.2.2.2.1. St Thomas' Hospital, King's College London, United Kingdom

Maxime Sermesant is a visiting lecturer in the Division of Imaging Sciences and Biomedical Engineering, St Thomas' Hospital, King's College London lead by Pr Reza Razavi. The XMR facility within this hospital is a unique opportunity to validate and exploit the cardiovascular modelling work.

7.2.2.2.2. Massachusetts General Hospital, Boston

A collaboration with Dr Jan Unklebach, Assistant Professor of Radiation Oncology and Dr Jayashree Kalpathy-Cramer, radiology instructor was initiated in 2013 around the topics of tumor growth modeling, radiotherapy planning and edema characterization from MRI. Matthieu Lê spent 2013 in the department of Radiation Physics at MGH.

7.2.2.2.3. Other International Hospitals

Collaborations with several other European hospitals have been established through the European projects VP2HF, Care4Me and MD PAEDIGREE.

ATHENA Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR

8.1.1.1. ANR ViMAGINE

Participants: Maureen Clerc, Rachid Deriche, Alexandre Gramfort [Parietal project-team, ENST since september 2012], Emmanuel Olivi [Former member of the Athena Project-Team], Théodore Papadopoulo, Anne-Charlotte Philippe.

Duration: *July 2008 to July 2013*

The partners of this project are ATHENA, the LENA (CHU Pitié-Salpétrière), and the Parietal project-team at Inria Futurs and Neurospin-Saclay.

This project takes a new challenge on the non invasive exploration of the Human visual system in vivo. Beyond the basic mechanisms of visual perception – which have already been investigated at multiple scales and through a large variety of modalities – we are primarily interested in proposing and exploring innovative solutions to the investigation of dynamic neural activations and interactions at the systems level. Bridging the elements involved in this endeavour requires that we are capable of observing, modelling and predicting the interplay between the anatomical/functional architecture of the brain systems and some identified timing properties of neural processes. The overall framework in which this project will be conducted is a federation of partners who will be bringing complementary expertise to this multidisciplinary research. The collaborators include experts in (1) electromagnetic and magnetic resonance brain imaging methods, (2) computational models of neural systems and (3) the neuroscience of vision. A central asset of our group is the easy access to state-of-the-art imaging platforms (e.g. high-density MEG and EEG arrays; 3T and 7T MR scanners) that will ensure the acquisition of quality experimental data.

8.1.1.2. ANR CO-ADAPT

Participants: Maureen Clerc, Dieter Devlaminck, Sebastian Hitziger, Loïc Mahé, Théodore Papadopoulo, Eoin Thomas, Romain Trachel.

Duration: *December 2009 to April 2014*

The partners of this projects are the INSERM U821 laboratory of Bron, the "laboratoire de Neurologie de la cognition" UMR6155 CNRS of Marseille, The Inria Lille Sequel project-team and the "Laboratoire d'Analyse Topologie et Probabilités" UMR6632/CNRS of Université de Provence, Marseille.

Brain Computer Interfaces (BCI) provide a direct communication channel from the brain to a computer, bypassing traditional interfaces such as keyboard or mouse, and also providing a feedback to the user, through a sensory modality (visual, auditory or haptic). A target application of BCI is to restore mobility or autonomy to severely disabled patients, but more generally BCI opens up many new opportunities for better understanding the brain at work, for enhancing Human Computer Interaction, and for developing new therapies for mental illnesses.

In BCI, new modes of perception and interaction come into play, and a new user must learn to operate a BCI, as an infant learns to explore his/her sensorimotor system. Central to BCI operation are the notions of feedback and of reward, which we believe should hold a more central position in BCI research.

The goal of this project is to study the co-adaptation between a user and a BCI system in the course of training and operation. The quality of the interface will be judged according to several criteria (reliability, learning curve, error correction, bit rate). BCI will be considered under a joint perspective: the user's and the system's. From the user's brain activity, features must be extracted, and translated into commands to drive the BCI system. Feature extraction from data, and classification issues, are very active research topics in BCI. However, additional markers may also be extracted to modulate the system's behavior. It is for instance possible to monitor the brain's reaction to the BCI outcome, compared to the user's expectations. This type of information we refer to as meta-data because it is not directly related to the command, and it may be qualitative rather than quantitative. To our knowledge, there is so far no BCI system that integrates such meta-data from the user's brain. From the point of view of the system, it is important to devise adaptive learning strategies, because the brain activity is not stable in time. How to adapt the features in the course of BCI operation is a difficult and important topic of research. A Machine Learning method known as Reinforcement Learning (RL) may prove very relevant to address the above questions. Indeed, it is an adaptive learning method that explicitly incorporates a reward signal, which may be qualitative (hence allowing meta-data integration). The aim of CO-ADAPT is to propose new directions for BCI design, by modeling explicitly the co-adaptation taking place between the user and the system (web site http://coadapt.inria.fr).

8.1.1.3. ANR NucleiPark

Participants: Rachid Deriche, Aurobrata Ghosh, Anne-Charlotte Philippe, Antoine Wolfermann.

Duration: *September 2009 to December 2013*

This project is about High field MR imaging (7T and 3T) of the brainstem, the deep nuclei and their connections in the parkinsonian syndromes with applications to prognosis, pathophysiology and improvement of therapeutic strategies. It involves three partners: The NeuroSpin team including C. Poupon and D. Le Bihan, the Inria with our project as well as the VISAGES project-team and the UPMC (University Pierre and Marie Curie, Paris) including INSERM U678 (H. Benali) and the CENIR (S. Lehericy).

The goal of the project is to find new neuroimaging markers of deep brain nuclei in neurodegenerative diseases that can be used for the diagnosis of Parkinsonian syndromes at the early stage. In addition, the goal is the characterization of lesions of deep brain structures and the detection of biomarkers of neuronal lesions in PD that can be related to clinical signs, such as gait disorders. Biomarkers of Parkinsonian syndromes could be used to create a diagnostic tool of the pathology and to correlate the identified markers with clinical signs. We will perform tractography of small fibre bundles using our HARDI techniques and Diffusion markers (anisotropy, apparent diffusion coefficient, fibre density, curvature, average diameter) will be collected along the reconstructed bundles.

Complementary parts of these objectives directly related to the acquisitions protocols have been accepted within the framework of another proposal submitted by the same partners and accepted for grant for two years (2009 & 2010) by the *France-Parkinson Association*

8.1.1.4. ANR Mosifah

Participants: Rachid Deriche, Maureen Clerc, Théodore Papadopoulo, Gonzalo Sanguinetti.

Duration: *October 2013 to September 2017*

This ANR Numerical Models 2013 project is about multimodal and multiscale modelling and simulation of the fiber architecture of the human heart. It started on October 2013 and involves three partners : Creatis Team, INSA, Lyon (I. Magnin, Y. Zhu); TIMC-IMAG, CNRS, Grenoble (Y. Uson) and the ATHENA project team.

It consists in modelling and simulating the ex vivo and in vivo 3D fiber architectures at various scales using multiphysical data from different imaging modalities working at different spatial resolutions. To this end, the myocardium of the human heart will be imaged using respectively Polarized Light Imaging (PLI) and dMRI.

Appropriate diffusion models will be explored including second and fourth order DTI models as well as HARDI models such as the single shell Q-Ball Imaging (QBI). These various types of images will be processed within the right Riemannian mathematical framework to provide tensor as well as Ensemble Average Propagator (EAP) and Orientation Distribution Function (ODF) fields. Virtual cardiac fiber structure (VCFS) will then be modelled using myocardial fiber information derived from each of these imaging modalities. Finally, diffusion behavior of water molecules in these VCFSs will be simulated by means of quantum spin theory, which allows computing ex vivo and in vivo virtual diffusion magnetic resonance (MR) images at various scales ranging from a few microns to a few millimeters. From the obtained virtual diffusion MR images, multiscale and probabilistic atlas describing the 3D fiber architecture of the heart ex vivo and in vivo will be constructed. Meanwhile, the simulation involving a large number of water molecules, grid computing will be used to cope with huge computation resource requirement.

We expect to construct a complete database containing a very wide range of simulated (noise and artifact-free) diffusion images that can be used as benchmarks or ground-truth for evaluating or validating diffusion image processing algorithms and create new virtual fiber models allowing mimicking and better understanding the heart muscle structures. Ultimately, the proposed research can open a completely novel way to approach the whole field of heart diseases including the fundamental understanding of heart physiology and pathology, and new diagnosis, monitoring and treatment of patients.

8.1.1.5. ANR MULTIMODEL

Participants: Théodore Papadopoulo, Maureen Clerc, Sebastian Hitziger, Emmanuel Olivi.

Duration: *December 2010 to May 2014*

The MULTIMODEL project stems from a conjoint INSERM-Inria scientific initiative launched in December 2008 and ended in 2010. It involves 5 partners (Inserm U751 in Marseille, U678 in Paris, U836 in Grenoble, U642 in Rennes and Inria ATHENA project-team).

The general objectives of the MULTIMODEL project are :

- To develop computational models at the level of neuronal systems that will help interpreting neuroimaging data in terms of excitation-, inhibition- and synchronization-related processes.
- To acquire multimodal datasets, obtained in rats and humans under physiological and epileptogenic conditions, which will be used to develop the biophysical models and to test their face validity and predictability.

Specifically, the following questions are dealt with:

- How can models be integrated in order to link data from different modalities (electro/magneto-encephalography, optical imaging, functional MRI)?
- What is the influence of hidden parameters on the observed signals (e.g. ratio of excitation/inhibition and synchronization degree across regions)?
- To what extent can biophysical modelling bring valuable insights on physiological and pathological brain activity ?

We operate at the level of population of cells, i.e. at a scale compatible with the resolution of neuroimaging tools (at the level of the mm). A novel model structure is being investigated, which includes astrocytes at this “mesoscopic” level and operates in networks of connected regions. Moreover, models in physiological and pathological conditions will be compared, which is a step towards a better understanding of mechanisms underlying epileptic condition.

8.1.1.6. ANR VIBRATIONS

Participants: Théodore Papadopoulo, Maureen Clerc, Rachid Deriche.

Duration: *Early 2014 to early 2018*

This Translational ANR project has just been been accepted.

Computational modeling, under the form of a “virtual brain” is a powerful tool to investigate the impact of different configurations of the sources on the measures, in a well-controlled environment.

The VIBRATIONS project proposes to simulate in a biologically realistic way MEG and EEG fields produced by different configurations of brain sources, which will differ in terms of spatial and dynamic characteristics. The research hypothesis is that computational and biophysical models can bring crucial information to clinically interpret the signals measured by MEG and EEG. In particular, they can help to efficiently address some complementary questions faced by epileptologists when analyzing electrophysiological data.

The project follows a three-fold strategy:

- construct virtual brain models with both dynamic aspects (reproducing both hyperexcitability and hypersynchronisation alterations observed in the epileptic brain) and a realistic geometry based on actual tractography measures performed in patients
- explore the parameter space though large-scale simulations of source configurations, using parallel computing implemented on a computer cluster.
- confront the results of these simulations to simultaneous recordings of EEG, MEG and intracerebral EEG (stereotactic EEG, SEEG). The models will be tuned on SEEG signals, and tested versus the surface signals in order to validate the ability of the models to represent real MEG and EEG signals.

The project constitutes a translational effort from theoretical neuroscience and mathematics towards clinical investigation. A first output of the project will be a database of simulations, which will permit in a given situation to assess the number of configurations that could have given rise to the observed signals in EEG, MEG and SEEG. A second – and major - output of the project will be to give the clinician access to a software platform which will allow for testing possible configurations of hyperexcitable regions in a user-friendly way. Moreover, representative examples will be made available to the community through a website, which will permit its use in future studies aimed at confronting the results of different signal processing methods on the same 'ground truth' data.

8.1.2. ADT

8.1.2.1. ADT MedInria-NT

Participants: Jaime Garcia Guevara, Loïc Cadour, Théodore Papadopoulo, Maureen Clerc, Rachid Deriche.

Duration: *December 2010 to December 2012, prolongated to December 2014*

The goal of this technical project, funded by Inria for 2 years, is to introduce some tools developed at ATHENA into the medInria platform. There are basically two such facilities:

- Integrate the tools developed for the statistical characterization of brain white matter fiber bundles.
- Develop an interface for M/EEG data within MedInria. This will focus on two main goals:
  - Create a facility to read and visualize M/EEG signals.
  - Integrate M/EEG forward problem tools.

8.1.2.2. ADT OpenViBe-NT

Participants: Théodore Papadopoulo, Maureen Clerc, Loïc Mahé.

Duration: *October 2012 to December 2014*

OpenViBE is an opensource software which development started in 2005 with the goal of offering an open research tool for BCI and for supporting disabled people. Since its release in 2009, this software has received a lot of success (+10.000 downloads). But since 2005, new use have appeared as well as some limitations. The current software thus lacks of some features that limit its use, deployment and perennity. The goal of this ADT is to solve these problems, to improve and to extend OpenViBe One main goal is to improve the usability and the attractivity of the software and to retain a large community of users so as to ensure its sustainability. This ADT will allow to support the research made in four Inria teams (ATHENA, HYBRID, NEUROSYS and POTIOC) on hot topics such as adaptive or hybrid BCIs.

8.2. International Initiatives

8.2.1. Inria Associate Teams

8.2.1.1. BRAINCONNECTIVITIES

Title: Fusing anatomical and functional connectivity information using diffusion MRI, MEG and EEG.

Inria principal investigator: Théodore PAPADOPOULO

International Partners (Institution - Laboratory - Researcher):

University of Québec, School of Higher Technology (Canada) - PhysNum Group, Centre de recherches mathématiques, Montréal - Théodore PAPADOPOULO

University of Sherbrooke (Canada) - Departement d'Informatique - Théodore PAPADOPOULO

Duration: 2012 - 2014

See also: http://brainconnectivities.inria.fr/wordpress/

Currently brain connectivity is studied through two different lenses: 1) Anatomical connectivity aims at recovering the "wires" that connect the various brain cortical "units", 2) Functional connectivity studies when and how cortical regions are connected. Providing tools to fuse these two complementary views is the central goal of this project. Our effort will focus on three imaging modalities: diffusion MRI (dMRI) , Electroencephalography (EEG) and Magnetoencephalography (MEG). dMRI (jointly with traditional MRI) provides a detailed anatomical view of the brain. It allows the recovery of the fiber structure of the white matter: these are the electrical connexions between distant cortical areas. But dMRI does not provide any clue on: 1) on the actual use of connexions during brain activity, 2) on the way information propagates along time for a given task. On the opposite, EEG and MEG (jointly named MEEG) provide (after source reconstruction) time courses of the activity of the cortical areas. It is possible to recover some connectivity information from these time courses, but these are purely signal based and do not take account of the anatomy so there are multiple solutions that are sometimes difficult to discriminate. Furthermore source reconstructions are regularized with purely mathematical a priori taking only partially account of the actual brain structures.The main goals of this project are to provide tools: 1) To acquire diffusion data more efficiently, 2) To use the information of dMRI to define better models and regularization schemes for spatio-temporal MEEG source reconstruction, 3) To use MEEG data to better understand the task-dependent spatio-temporal structure of connectivity patterns.

8.2.2. Inria International Partners

8.2.2.1. Informal International Partners

- CMRR, University of Minnesota, USA (Christophe Lenglet)
- Department of CISE, the University of Florida, Gainesville, USA (Baba C. Vemuri)
- Centre for Medical Image Computing (CMIC), Dept. Computer Science, UCL, UK (D. Alexander)
- SBIA, University of Pennsylvania Medical School, USA (R. Verma).
- University Houari Boumedienne (USTHB, Algiers) (L. Boumghar) and University of Boumerdes, (D. Cherifi), Algeria.
- BESA company of EEG/MEG source localisation.

8.3. International Research Visitors

8.3.1. Visits of International Scientists

- Maxime Descoteaux (USherbrooke) visited ATHENA (September 10-15 2013) and (December 13-20, 2013).

- Gabriel Girard (USherbrooke) has joined ATHENA for one year for a joint PhD (Samuel de Champlain grant) from October 10th, 2013 to September 30th, 2014. He is co-supervized by M. Descoteaux and R. Deriche.
- Jean-Marc Lina (CRM) visited ATHENA from December 17th to December 21th.

8.3.1.1. Internships

- Susana Merino-Caviedes (Valladolid University) visited ATHENA from Sep 2013 until Nov 2013.
- Mouloud Kachouane (USTHB, Algiers) visited ATHENA from October 20 until December 20, 2013).
- Thinhinane Megherbi (USTHB, Algiers) and Mouloud Kachouane (USTHB, Algiers) visited ATHENA (June 2013).

AXIS Project-Team

7. Partnerships and Cooperations

7.1. Regional Initiatives

7.1.1. CPER Telius - FocusLab Platform (2010 - 2013)

Participant: Brigitte Trousse [correspondent].

This grant, funded by Regional and European support, covers several areas. AxIS is being funded through the experimental platform on the usage of information systems called Focus (and renamed FocusLab). Our goal is to support the observation and analysis of user behaviors within ICT-based experimental projects adoptng a user driven approach. Hardware, software and documentation are proposed within this platform (http://focuslab.inria.fr).

Let us cite AxIS projects which used FocusLab platform: TIC TAC, ECOFFICES, ECOFAMILIES and ELLIOT. In addition to AxIS, others Inria teams (WIMMICS,REVES,MAESTRO,PLANETE) and external organisations or teams (I3M laboratory from University of Nice Sophia Antipolis, CSTB Sophia Antipolis, the Ergonauts Association, two Elliot partners) have used elements of FocusLab.

7.1.2. Labex UCN@Sophia

Participant: Brigitte Trousse [correspondent].

Title: User-Centered Network

URL: http://www.ucnlab.eu/node/5

Instrument: Labex

Coordinator: University of Nice - Sophia Antipolis

Others partners: I3S (UNS / CNRS), LEAT (UNS / CNRS), Inria, EURECOM

Abstract: The Labex UCN@Sophia proposes a research program for researchers of the ICT Campus at Sophia Antipolis, program motivated by a vision which positions the user at the centre of the network. Five scientific and strategic directions are proposed: a) Data Centric Networking, b) Distributed and Ubiquitous Computing, c) Security, privacy and network neutrality, d) Infrastructures: Heterogeneity and Efficiency and e) Energy Efficiency. Two application domains have been selected: Homecare services for persons with reduced autonomy and Intelligent Transport Systems.

See : http://www.ucnlab.eu/

AxIS research aimed mainly several of the addressed domains and research of user-centred design and co-creation with users (cf. Sections 4.2 and 4.4).

7.1.3. ICT Usage Lab: collaboration with University of Nice Sophia Antipolis

Participants: Brigitte Trousse [correspondent], Céline Lacroix.

In 2013 we had many activities.

First ICT Usage Lab started its involvement in **EIT KIC Labs** via three funded tasks (see Sections 7.3.3 , 7.3.5 and 7.3.4). We describe the Experience & living labs facilities and services offered by EIT partners of ICT Usage Lab based on the EIT ICT Labs template elaborated by E&LL research catalyst (cf. Section 7.3.3).

This year was the occasion for Inria to collaborate for **the first time in the context of EIT KIC Labs** with researchers from **University of Nice - Sophia Antipolis**:

- **I3S laboratory** - University of Nice Sophia Antipolis: F. Baude (EIT contact) from OASIS research-team project on one KIC ICT Labs task (cf. Section 7.3.4),
- **I3M laboratory** - University of Nice Sophia Antipolis: C. Lacroix (ICT Usage lab contact), F. Debos and P. Rasse (leader) related to two KIC ICT labs Call 2013 submissions: TravelDashBoard2 leaded by Thales including Arles Inria research-team and CityCrowdSource2 leaded by Loria (Madynes Inria research team-project) following the 2013 activity we have supported (cf. Section ell).

Secondly as supporting partner of the European IDeALL project, we prepared a presentation of Ecofamilies and ELLIoT projects for a France Living Labs talk at the last IDeALL meeting (Barcelona) in January 2014.

Inria and ICT Usage Lab are official partners of the Innovative City Convention event from 2012 (Nice Côte d'Azur): http://www.innovative-city.fr/partenaires/partners/. In this context we invited three speakers: in 2012 Michael Nilsson (CDT, Lulea, Finland) and Khaldoun El Agha (ICT Labs - EIT, Paris) and in 2013 Jarmo Eskelinen (Forium Virium Helsinki, ENoLL).
Thirdly the EllIoT project via Green Services Use case (2011-2013) was rich in a lot of new assets for ICT Usage Lab (cf. Section 7.3.1):

- IoT: Constitution of a pollution IoT database from ICT Usage Lab citizen mobile and fixed sensors with around 4 millions of pollution measures,
- IoT: Interesting ideas (issued from co-creation workshops) of new smart objects (mainly for asthmatic people) and user feedback on the green watch,
- IoT: Acquisition of four types of pollution stations,
- IoT: Three improved IoT user guides of our ICT Usage Lab stations,
- IoT: A first validation of our prototype of a new low cost dust (PM10) station (with Rasburry and Arduino),
- Citizen Sensing: MyGreenServices platform (cf. Section 6.5.1),
- User production: Qualitative database based on User productions,
- User production: Usage database issued from logs of MyGreenServices portal,
- Knowledge: Improved know-how in modeling and measuring user experience of an IoT-based service based on KSB UX model and FocusLab advanced data analysis methods (cf. Section 6.5.3 ,
- Knowledge: Development of a new version (v1.3) of Focuslab server (cf. Section 6.6),
- Knowledge: Elaboration and test of two new Ideation methods (Aloha!, GenIoT).

We pursued our informal contacts with Noel Conryut from the living lab "UR.LL.TL" for Teaching and Learning (Island of the Reunion) and with the urban community CINOR related to the deployment of LL projects on this territory.

Finally various tutorials related to Focuslab hardware and software (cf. Section 6.6) have been organised and proposed to Inria members and collaborators (I3S and I3M laboratories from University of Nice Sophia Antipolis, CSTB, CHU Nice). B. Senach took contact with C. Tallec from Utilisacteur in order to plan in the future a workshop about Participative Service Design in Sophia Antipolis.

7.1.4. Collaboration Agorantic-Inria

Participants: Guillaume Pilot, Bernard Senach, Brigitte Trousse.

As the craze for culture and exhibition is increasing, museums have to deal with crowds, stronger expectations about information quality and quantity and requirements for planned personalized visits.

A collaboration began this year between ICT and HSS teams from Agorantic and Inria Sophia Antipolis, including AxIS, Maestro and Wimmics, conducting interdisciplinary ICT-HSS research. This initial collaboration resulted in setting up a ANR proposal of a project for analyzing, designing, and evaluating a recommendation system helping visitors (or groups of visitors) to follow through a museum a tailored path within an exhibition, according to their specific profile. In this ANR proposal called SyReMuse ("Système de recommandation pour la visite des musées et des expositions"), AxIS researchers were involved in the modelling of the visitors (or group of visitors)' cultural experience which will support the design and evaluation of the recommender system and in specifying recommendation computation. A preliminary study of the logs from the Web site of Grenoble Museum (France) providing recommendations according to types of user profiles (families, professionals, students, scholars and groups) has been made in order to better evaluate the research problem to be addressed.

A Inria collaborative project (named "Color") proposal for 2014 is under preparation as a first step of our collaboration.

7.1.5. Involvement in Regions

PACA Region

- B. Trousse was invited at the strategical orientation committee of the PACALABS instrument (PACA Region, Marseille, June 12th) about the evaluation of the 4 past yeras of Pacalabs and to prepare the programme of the next PACALABS
- B. Trousse for ICT Usage lab has increased contacts with University of Nice Sophia Antipolis (mainly the laboratories I3M via Céline Lacroix and Paul Rasse et I3S via Françoise Baude) disseminating the living lab approach and involving them as ICTUL partners for two KIC ICT Labs 2013 Call submissions (TraveldashBoard2, CityCrowdSource2).
- Green Services use case from the European Elliot project was deployed in Nice Côte d'Azur with several experiments
- Participation in the organisation of invited talks of the Innovative City Convention (Nice, 2012).

Midi Pyrénées Region

- AxIS (C. Detraux and D. L. Scapin) are involved in ANR-PIMI project (cf. Sections 7.2.1 and 6.4.1) where the Midi-Pyrénées region and IUT Tarbes are pilot-partners.

7.2. National Initiatives

7.2.1. ANR PIMI (2010 - 2013)

Participants: Claudia Detraux, Dominique Scapin [correspondent].

Title: PIMI

Type: ANR

Defi: Personal Information Space

Instrument: Verso 2010

Duration: 2010 - 2013

Coordinator: Genigraph

Others partners: LRI, IRIT, Institut Telecom, Montimage, The Grand Duchy of Luxembourg

Abstract: PIMI Project aims at the definition of a design environment and a deployment platform for Personal Information Management system (PIM). The future PIM must provide the end-user personal data access with services that are relevant to his needs. In order to take mobility into account, the PIM will be accessed both by mobile devices (smartphone) and personal computers.

The main contributions this year are described in Section 6.4.1 .

7.2.2. FIU FIORA (2012-2015)

Participants: Yves Lechevallier [correspondent], Thierry Despeyroux.

Program: FIU (14th call)

Project acronym: FIORA

Project title: Moteur d'inférences pour la personnalisation

Duration: 2012-2015

Coordinator: Michel Manago (SME KIOLIS)

Other partners: Editions SOLAR, Mondeca, Inria (AxIS), ISEP, UNiversity of Paris XIII

Abstract: This project aims the design and the development of FIORA an engine offering personnalised content. Personalisation will be based on context parameters related to the user and available semantic information. The main result will be to develop an engine merging case-based reasoning technics, recommandation technics based on collaborative filtering and data mining. The proof concept will be experimented in two domains: a) Nutrition and b) tourism and Health (use of the cohort Nutrinet with more than 200 users) and b) e-tourism.

This project starts at the end of 2012. See our work in Section 6.2.9 .

7.2.3. LIMOS, University of Clermont-Ferrand

A collaboration has been initiated during 2013 with the LIMOS laboratory managed by Enjelbert Mephu Nguifo and Olivier Raynaud in the context of the supervision committee of Dia Diyé 's PhD thesis on the topics security/trust, usage mining and recommender systems. B. Trousse participated in two PhD Thesis meetings: September 27 (working meeting) and October 9th (annual PhD thesis supervision committee meeting).

7.2.4. Lorraine Smart Cities Living Lab and ERPI - University of Lorraine Living

B. Trousse as President of France Living Labs and Inria representative of ICT Usage lab had various collaborations this year with the ERPI laboratory of the University of Lorraine:

- Common Work with Laurent Dupont on a template describing a living Lab;
- Workshop on Co-creation with Users at Innovative City Convention (Nice, June): Claudine Guidat and Laure Morel both Professors at ERPI lab gave a talk on the Lorraine Smart Cities Living Lab;
- Study of an interdisciplinary approach of the Accelerated Citizen Co-Creation in the context of Living Labs : from usage scenarios to 3D representations (including PhD thesis subjects).

7.2.5. Living Lab of Cité du Design - St Etienne

B. Trousse as President of France Living Labs had various collaborations this year with "Cité du Design"

- Participation as supporting partner of the European project called IDeALL managed by Isabelle Verihlac from "the Cité du Design". Preparation of a presentation related to the French supporting partners as Living labs at the last meeting of the project (January 2014, Barcelona);
- F2L Support of an ANR proposal related to silver economy called DECMA: this proposal is on "the design in the context of the day life of Alzheimer patients and help people" (leader Cité du design St Etienne) - "Sociétés innovantes, intégrantes et adaptatives. Axe : Innovations".

7.2.6. France Living Labs

URL: http://www.france-livinglabs.fr/

In 2013 our activities were multiple.
First ENoLL and France Living Labs signed a formal cooperation agreement (MoU - Memorandum of Understanding) on February 24th in order to have closer communication and cooperation in their activities and initiatives through meetings, exchanging of information, knowledge, experiences and best practice. See the video on http://www.youtube.com/watch?v=EJNXQ2VUtFU.

Secondly three working groups started:

- Design & Living labs with more than 13 living labs (cf. our presentation at the last IDeALL project Slides)
- Living Labs for Silver Economy and
- Cartography and evaluation of living lab projects inside F2L members on two aspects (co-creation methods and territory role).

Thirdly France Living Labs supported two proposal submissions of the 2013 ANR Call: one with University of Lorraine and "Cité du Design" and another proposal with "Cité du design".

Finally some F2L members were involved various working groups in order to make proposals for the contract "Economy Silver". This contract was signed on December 12th and France Living Labs is mentioned at the page 86 as a key actor for the action 6.2 (Support to the development of living labs in Silver Economy both a t the national and international levels). See the contract here

7.3. European Initiatives

7.3.1. FP7 ICT ELLIOT project (2010-2013)

Participants: Xavier Augros, Florian Bonacina, Mylène Leitzelman, Anne-Laure Negri, Guillaume Pilot, Bernard Senach, Caroline Tiffon, Brigitte Trousse [correspondent].

Type: COOPERATION

Challenge: Internet of Things (IoT) and enterprise environments

Instrument: Specific Targeted Research Project

Objective: Internet of Things and Enterprise environments

Duration: September 2010 - June 2013

Coordinator: TXT Polymemia (Italy)

Partners: University of Nottingham (UK), University of Readings (UK), BIBA (Germany), Hospital San Rafael (Italy), CENG (Italy), Fing (France), Vulog SME(France)

Inria contact: Brigitte Trousse

See also: http://www.elliot-project.eu/

Abstract: The ELLIOT project (Experiential Living Labs for the Internet of Things) aims at developing an IoT experiential platform where users/citizen are directly involved in co-creating, exploring and experimenting new ideas, concepts and technological artifacts related to IOT applications and services. Based on a three levels experiential model issued from previous European projects, the study will capitalize on existing practices of co-creation in IoT contexts. It will allow the exploration of the potential impact of IOT and of the Future Internet in the context of the Open User Centered Innovation paradigm followed in the Living Lab approach.

This year we conducted various tasks related to the Green Services Use case:

- Implementation of MyGreenServices application which collects IoT data from electric cars and citizens sensors. stored usage data for sending to the ELLIOT platform (cf. Section 6.5.1
- Specification of the methodology for user experience measurement for Green Services Use case (cf. Section 6.5.3).
- Two experiments of MyGreenServices (February and June).
- Dissemination at Innovative City Convention with Special ELLIOT Citizen Awards.

Inria hosted two ELLIOT meetings on user experience measurement (KSB model and use cases) as weel as general meetings. We contributed in the various deliverables including the two public ones [38] and [37]. See also our results in Section 6.5 .

Finally the Elliot project (2011-2013) was very rich in terms of new assets for Inria and for ICT Usage Lab (cf. 7.1.3).

MyGreenServices was evaluated as Good Practice by the international Design for All foundation (for the 2014 awards).

7.3.2. COST TwinTide (2010-2013)

Participant: Dominique Scapin [correspondent].

Program: COST IC0904

Project acronym: TwinTide

Project title: Towards the Integration of Transectorial IT Design and Evaluation

Duration: 2010 - 2013

Coordinator: Effie Lai-Chong Law - Swiss Federal Institute of Technology (ETH Zà¼rich), Switzerland (CH) / University of Leicester, UK

Other partners: see http://www.irit.fr/recherches/ICS/projects/twintide

Abstract: Towards the Integration of Transectorial IT Design and Evaluation is a usability and user experience research community running under the auspices of COST (http://www.cost.esf.org/). The main objective is to harmonize research and practice on design and evaluation methodologies for computing artefacts, across sectors and disciplines, bringing together researchers and D&E professionals.

7.3.3. EIT KIC ICT Labs (2013) : Experience & Living Labs Research Catalyst

Participants: Brigitte Trousse [correspondent], Caroline Tiffon, Florian Bonacina.

Program: EIT ICT Labs

Project acronym: Activity E&LL Catalyst Coordination activity from Research Catalysts, included for 2014 in Technology EXperimentation Catalyst.

Project title: E&LL Catalyst Coordination Activity

Duration: 2013

Coordinator: F. Pianiesi (Trento Rise, Italy)

Other partners: Inria, (Hungary), TUBerlin, U. Bologna, Telecom Italia, Siemens/VMZ (Germany), DFKI (Germany)

Abstract: The Catalyst Coordination Activity will boost the usage of the E&LLs Catalyst by means of a set of service provision programs. Tasks and Activities from the Action Lines represent the customers of the Catalyst Coordination Activity. The catalyst involves a Team of Experts and leverage assets from available "Open E&LLs", as a set of accessible facilities. "Open E&LLs" function as a one-stop-shop for user-centered research services, as well as hosts of experimentation activities by customers.

This year, we were involved in various works:

- Support to Loria (mainly Madynes research-project team - Thomas Siverston and Abdelkader Lahmadi) related to the CityCrowdSource activity and within the context of the *crowdout* application (with targeted users such city administrators and citizen). Our support relied mainly on the improvement of the ergonomics aspects of the application and pre-tests with users of the first prototype. Redaction of deliverable (17 pages);
- Dissemination of E&LL research catalyst to the Management Committee of the French EIT node and to the Smart Cities action line;
- Support to EIT partners during EIT 2013 Call event (April, Paris), mainly those interested by the two action lines , Smart Cities and Cloud Computing, which are lead by the french EIT KIC labs node;
- Contribution to the elaboration of a Service Provisioning template for Open Living Labs.
- Collectinf data from EIT E&LL facilities from the French EIT node in order to make them visible on an internal EIT Web site (developed by ELL catalyst - Trento);

7.3.4. EIT KIC ICT Labs (2013) : CityCrowdSource Activity - Urban Life and Mobility

Participants: Brigitte Trousse [correspondent], Guillaume Pilot.

Program: EIT ICTLabs

Project acronym: Activity 13 052 from Intelligent Mobility and Transportation Systems action line - Allocation 7396 (IMS), renamed Future Urban Life and Mobility (ULM) mid 2013

Project title: Multimodal Mobility

Duration: 2013, from June to December

Coordinator: F. Baude (OASIS Inria-UNS) and B. Kwella (Fraunhofer Gesellschaft)

Other partners: Inria, BME (Hungary), TUBerlin, U. Bologna, Telecom Italia, Siemens/VMZ (Germany), DFKI (Germany)

Abstract: The activity seeks to specify the building blocks, a platform and a prototype for the provision of multimodal mobility. The main motivation is to facilitate the use of ICT to support the efficient organization of Accessible Mobility (support for people with special needs, economical optimization of mobility and transportation, trip planning, information on available transport modes, etc). It therefore provides the basis for sustainable future mobility.

AxIS was involved in the implementation of a Play-based demonstrator and implements, in collaboration with OASIS Inria research-project an interface between MyGreenServices platform and the PLAY platform for elaborating a use case based on our environmental sensors.

7.3.5. EIT KIC ICT Labs (2013) : Q&A - Doctoral School

Participants: Brigitte Trousse [correspondent], Caroline Tiffon.

Program: EIT ICT Labs

Project acronym: DSL

Project title: Activité DSL 13108-Support Evaluation

Duration: 2013, from March to December

Coordinator: C. Queinnec (UMPC, Paris, France)

Other partners: Inria, University of Turku, etc.

Abstract: EIT Doctortal School

Inria (ICT Usage lab) for its expertise in usage analysis was requested by the DSL leader to support the University of Turku to managae the Q/A tasks for the doctoral school. We made some recommendation for improving questionnaires and anticipating future analysis in terms of data coding. We analysed (with Sphinx IQ) students questionnaires from EIT Doctoral school, and reported results in an internal EIT KIC Labs document. A preliminary study on how to measure the main I&E outcomes of I&E courses based on Bloom'experential learning [56] has been started.

7.4. International Initiatives

7.4.1. Participation in other International Programs

7.4.1.1. FACEPE CM2ID, Brazil 2003-2013

Participants: Yves Lechevallier, Marc Csernel.

During 2013 we continued a collaboration on social network data analysis with F.A.T. De Carvalho from Federal University of Pernambuco (Recife) and Orpailleur (Inria Nancy Grand Es -LORIA).

A scientific project **Combining Numerical and Symbolical Methods for the Classification of Multi-valued and Interval Data (CM2ID)** submitted by Francisco de Carvalho and A. Napoli has been accepted for 2013 by FACEPE and Inria. The project started on January and will end on 12/2013. Researchers and students are concerned by this project from Orpailleur, AxIS and CIn-UFPE side. It aims at developing Numerical and Symbolical methods of clustering on Multi-valued and Interval Data.

This project aims at developing and comparing clustering algorithms for interval and multi-valued data. Two families of algorithms are studied, namely clustering algorithms based on the use of a similarity or a distance for comparing the objects, and classification algorithms in Formal Concept Analysis (FCA) based on attribute sharing between objects. The objectives here are to combine the facilities of both families of algorithms for improving the potential of each family in dealing with more complex and voluminous datasets, in order to push the complexity barrier farther in the mining of complex data. Biological data, namely gene expression data, are used for test and evaluation of the combination of algorithms. The project involves three teams, one Brazilian team and two French Inria teams (AxIS and Orpailleur), including specialists of clustering and classification methods. Thus the complementarity of the teams is ensured and, in addition, close contacts exist with experts of the domain of data for carrying on a complete evaluation of the results obtained by the combined algorithms expected to be designed during the project.

7.4.2. Informal International Partners

B. Trousse maintained collaborations with Morocco (cf. Section 6.2.10):

- ENSAM - Meknès (E.L. Moukthar Zemmouri [75]),
- National High School of Electrical and Mechanical engineering (ENSEM)Casablanca (H. Behja).

7.4.3. Participation to Standards in Ergonomics

Participant: Dominique Scapin [correspondent].

Standardization in ergonomics is increasingly important due to the application of the European directives about the introduction of measures to encourage improvements in the safety and health of workers (e.g., 2006/42CE on security of machinery); as well as taking into consideration national and international legislation, including accessibility. Standardization in ergonomics covers many issues. The contributions from AxIS (D. L. Scapin) at Inria concern mainly software ergonomics, in the context of AFNOR X35A, X35E, as well as ISO mirror groups:

- National: AFNOR X35A ("Ergonomie") (expert); AFNOR X35E ("Ergonomie des Logiciels Interactifs"), AFNOR groupe de travail "Normes de processus ergonomiques" (chair) [71].
- International: ISO/TC 159/SC4/WG5 (Software ergonomics and human-computer dialogues) (expert); ISO/TC 159/SC4/WG6 (Human-centred design processes for interactive systems) (expert); ISO/TC 159/SC4/WG9 (Tactile and Haptic Interactions) (expert); ISO/TC 159/SC4/WG28 (System and software product Quality Requirements and Evaluation - Common industry Format) (expert); ISO/TC 159/SC1/WG1 (Ergonomic principles) (expert).

7.5. International Research Visitors

7.5.1. Visits of International Scientists

AxIS Rocquencourt welcomed various international scientists from Brazil:

- Francisco de Carvalho (UFPE, Brazil) [20],
- Sergio Queiroz (UFPE, Brazil) [19],

AYIN Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

- Paula Craciun and Josiane Zerubia have been in contact with Antoine Mangin, Scientific Director at ACRI-ST (http://www.acri-st.fr/English/index.html), in Sophia Antipolis to discuss Paula Craciun's research on boat detection and counting in Mediterranean harbors using marked point processes.
- Zhao Liu and Josiane Zerubia met several times with Prof. Bahadoran from CHU Nice/Inserm (Faculty of Medicine, Dermatology department, at l'Archet 2 hospital in Nice) and Dr Queille-Roussel, CPCAD managing director at CHU Nice (Faculty of Medicine, Dermatology department, at l'Archet 2 hospital in Nice) to discuss Ayin's research on semi-automatic acne detection.

8.2. European Initiatives

8.2.1. Collaborations with Major European Organizations

LIRA consortium

Partners: Philips R&D (Eindhoven), CWI (Amsterdam), Fraunhofer Institutes (Berlin, Stuttgart, Darmstadt), Inria-SAM

Skincare image and signal processing: analysis, modeling and characterization of the condition of human skin.

8.3. International Initiatives

8.3.1. Informal International Partners

Qiyin Fang.

Subject: New optical sensors for skin imaging and their biomedical applications.

Institution: McMaster University (Canada).

Zoltan Kato.

Subject: Multi-layer Markovian models for change detection in aerial and satellite images.

Institution: Szeged University (Hungary).

Gabriele Moser, Sebastiano Serpico.

Subject: Hierarchical Markov random fields for multi-temporal and multi-resolution classification in remote sensing.

Institution: Genoa University (Italy).

Anuj Srivastava.

Subject: Statistical shape analysis of functions, curves, and surfaces.

Institution: Florida State University (USA).

Zoltan Kato.

Subject: Random field models of shape.

Institution: Szeged University (Hungary).

Jochen Einbeck, Stuart Jones.

Subject: Statistical shape modelling for geology.

Institution: Durham University (UK).

8.4. International Research Visitors

8.4.1. Visits of International Scientists

- Qiyin Fang (McMaster University, Canada, one week in May 2013).
- Zoltan Kato (Szeged University, Hungary, from Jul 2013 until Aug 2013).
- Gregoire Mercier (Telecom Bretagne, Brest, one week in June 2013 and one week in December 2013).
- Gabriele Moser (Genoa University, Italy, one week in July 2013).

8.4.2. Internships

Claudio Price González (from January 2013 until March 2013)

Subject: Graph-based model for multitemporal segmentation of sea ice floes from satellite data.

Institution: Federico Santa Maria Technical University and Inria Chile.

BIOCORE Project-Team

8. Partnerships and Cooperations

8.1. National initiatives

8.1.1. National programmes

- **ANR-GeMCo:** The objective of this project is to do model reduction, experimental validation, and control for the gene expression machinery in E. coli. The project is funded by ANR (2010-BLAN-0201-01) and coordinated by M. Chaves.
- **ANR-Facteur 4:** The objective of this project to propose non OGM strain of microalgae with enhanced performance. BIOCORE is involved in the directed selection of microalgae with interesting properties from an industrial point of view. The theory of competition is used to give a competitive advantage to some species. This competitive advantage can be provided by an online closed loop controller.
- **ANR-Purple Sun:** The objective of this project (ANR-13-BIME-004) is to propose study and optimize a new concept consisting in coupling the production of microalgae with photovoltaic panels. The main idea is to derive the excess of light energy to PV electricity production, in order to reduce both the phenomena of photoinhibition and process overwarming.
- **ANR-FunFit:** The objective of this project is to develop a trait-based approach linking individual fitness of fungal plant pathogens to ecological strategies. The idea is to derive eco-epidemiological strategies from fitness optimization in colonized environments and during colonization, as well as understanding the coexistence of sibling species. This project is co-coordinated by F. Grognard.
- **SIGNALIFE:** Biocore is part of this Labex (scientific cluster of excellence) whose objective is to build a network for innovation on Signal Transduction Pathways in Life Sciences, and is hosted by the University Nice Sophia Antipolis.
- **RESET:** The objective of this project is to control the growth of *E. coli* cells in a precise way, by arresting and restarting the gene expression machinery of the bacteria in an efficient manner directed at improving product yield and productivity. RESET is an “Investissements d’Avenir” project in Bioinformatics (managed by ANR) and it is coordinated by H. de Jong (Ibis, Inria)
- **FUI-Salinalgue:** The objective of this project is to take benefit of endemic microalgae species in areas of high salinity (previously used to produce salt) to produce both biofuel (either lipid based or methane) and co products. BIOCORE is in charge of lab scale experiments and of the modelling of the process.

8.1.2. Inria funding

- **ColAge:** The goal of this joint Inria-INSERM consortium is to study bacterial growth and aging by using mathematical modelling and computational predictions to design and implement a *de novo* biological system. This Large-Scale Initiative Action is partly funded by Inria and supervised by H. Berry (Beagle, Inria).

8.1.3. INRA funding

- **Propagules:** INRA-SPE is funding the project “Effet de différentes composantes de la pression de propagules sur le succès d’établissement d’un auxiliaire de lutte biologique" in which BIOCORE is a partner with INRA Sophia Antipolis (2011-2013).
- **Dynamique spatiale:** INRA-SPE is funding the project “Intégration des approches comportementales et démographiques de la dynamique spatiale des populations d’insectes” in which Biocore is a partner with INRA Sophia Antipolis and Agrocampus Ouest (2012-2014).

- **Take Control:** This project, "Deployment strategies of plant quantitative resistance to take control of plant pathogen evolution," is funded by the PRESUME call of the SMAcH INRA metaprogram. BIOCORE is a partner together with INRA PACA (Sophia Antipolis and Avignon) and INRA Toulouse (2013-2016). This project will provide the major part of the funding for the experiments held for Elsa Rousseau's thesis.

8.1.4. Networks

- **RTP-M3D:** BIOCORE is a participant in the RTP-M3D workgroup (Mathématiques et décision pour le développement durable) that is supported by the "Environment and sustainable growth" department of CNRS. L. Mailleret is one of the co-leaders of M3D.
- **GDR PROBBE:** The objective of this GDR is the development of new biotechnological processes based on microorganisms producing metabolites which can be used as fuel for transportation (lipids, sugars, methane, hydrogen, ...). BIOCORE is taking part mainly in the modelling and control aspects of the processes involving anaerobic bacteria or microalgae.
- **COREV:** BIOCORE is an active participant in the research group COREV (Modèles et théories pour le contrôle de ressources vivantes et la gestion de systèmes écologiques).
- **Seminar:** BIOCORE organizes a regular seminar "Modeling and control of ecosystems" at the station zoologique of Villefranche-sur-Mer, at INRA-ISA or at Inria.

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. PURE

Title: Pesticide Use-and-Risk reduction in European farming systems with Integrated Pest Management

Type: COOPERATION (ICT)

Instrument: Collaborative Project (CP)

Duration: 2011 - 2014

Coordinator: Françoise Lescourret (INRA Avignon, FR)

Other partners: **Research:** Institut National de la Recherche Agronomique - INRA (FR) Rothamsted Research - RReS (UK) Aarhus University - AU (DK) Julius Kühn Institut - JKI (DE) Stichting DLO - DLO (NL) Wageningen University - WU (NL) Consiglio Nazionale delle Ricerche - CNR (IT) Agricultural Institute of Slovenia - KIS (SLO) James Hutton Institute - JHI (UK) Fondazione Edmund Mach - FEM (IT) Instituto Valenciano de Investigacio- nes Agrarias - IVIA (ES) Institute of Plant Protection - IOR (PL) University of Debrecen - Centre of Agricultural Sciences - UDCAS (HU) Joint Research Centre - Institute for Prospective Technological Studies - JRC-IPTS (EU **Extension:** Knowledge Centre for Agriculture - VFL (DK) Association de Coordination Technique Agricole - ACTA (FR) **Industry:** Bayer Crop Science (DE) BIOTOP (FR) Natural Plant Protection (FR) Burkard Manufacturing Co Ltd (UK) Blgg Bv (NL) **Management:** INRA Transfert (FR)

See also: http://www.pure-ipm.eu/project

Abstract: The overall objective of PURE is to provide practical integrated pest management (IPM) solutions to reduce dependence on pesticides in selected major farming systems in Europe, thereby contributing to a reduction of the risks to human health and the environment and facilitating the implementation of the pesticides package legislation while ensuring continued food production of sufficient quality.
PURE will provide IPM solutions and a practical toolbox for their implementation in key European farming systems (annual arable and vegetable, perennial, and protected crops) in which reduction of pesticide use and better control of pests will have major effects. In that project, L. Mailleret develops modeling approaches dedicated to the optimization of plant protection methods relying on biological control and integrated pest management.

8.2.2. Collaborations with Major European Organizations

Imperial college, Department of Chemical engineering (UK)

Modelling and optimization of microalgal based processes.

Imperial College, Centre for Synthetic Biology and Innovation, Dept. of Bioengineering (UK)

Study of metabolic/genetic models

University of Stuttgart, Institute for Systems Theory and Automatic Control (D)

Identification of gene networks

8.3. International Initiatives

8.3.1. Inria International Partners

8.3.1.1. Inria informal international partners

Universidad Técnica Federico Santa María, Departamento de Matemática, Valparaíso, Chile
Universidad de Chile, Departamento de Matemáticas, Ñuñoa Santiago, Chile
Ben-Gurion University of the Negev, Microalgal Biotechnology Laboratory, Beer Sheva, Israel
Center for Environmental Technology and Engineering, Massey University , Palmerston North, New Zealand.

8.3.2. Participation In International Programs

BIOCORE is involved in the Bionature project from Inria Chile – CIRIC (the Communication and Information Research and Innovation Center), in collaboration with four Chilean universities (Universidad de Chile, Universidad Tecnica Federico Santa Maria, Pontificia Universidad Catolica de Valparaiso, and Universidad de la Frontera). The Bionature project is devoted to natural resources management and the modeling and control of bioprocesses.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

We only list the visitors that stayed more than 2 days in our project-team or presented a seminar

- Claude Aflalo (Ben Gurion University of the Neguev, Israel), 1 week;
- Andrei Akhmetzhanov (Université de Montpellier II, F), 1 week;
- Gonzalo Ruiz (Catholic University of Valparaiso, Chile), 2 days;
- David Jeison (University of La Frontera, Chile), 2 days;
- Benoit Guieysse (Massey University, New Zealand), 1 day;
- Quentin Béchet(Massey University, New Zealand). 6 days;
- Yves Dumont (CIRAD, F), 1 week;
- Andreas Kremling (TU Munchen, Germany), 1 day;
- Leon Glass (McGill University, Canada), 3 days;

8.5. Project-team seminar

BIOCORE organized a 3-day seminar in October in Tourrettes-sur-Loup. On this occasion, every member of the project-team presented his/her recent results and brainstorming sessions were organised.

An additionnal 2-day seminar was dedicated to modelling and control of microalgae.

CASTOR Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR

- ANR ECINADS

  Castor is associated to the ANR ECINADS project started in end of 2009, devoted to the design of new solution algorithms for unsteady compressible flows, adapted to scalable parallelism and to reverse (adjoint) Automatic Differentiation. See in the activity report of Ecuador.

- ANR ESPOIR

  The ANR ESPOIR (Edge Simulation of the Physics Of Iter Relevant turbulent transport) associates the CASTOR team with the M2P2, LPIIM and LATP laboratories in Marseille and IRFM in Cadarache to investigate edge plasma turbulence. The numerical simulation of the plasma wall interactions requires efficient codes and thus the development of advanced numerical methods and solvers. The aim of this project is to study different numerical strategies for edge plasma models in the real geometrical and magnetical configurations corresponding to the future Iter machine.

- ANEMOS : ANR-11-MONU-002

  ANEMOS : Advanced Numeric for Elms : Models and Optimized Strategies associates JAD Laboratory/Inria (Nice, Manager), IRFM-CEA (Cadarache), Maison de la Simulation (Saclay) and Inria EPI Bacchus (Bordeaux) Elms are disruptive instabilities occurring in the edge region (SOL) of a tokamak plasma. The development of Elms poses a major challenge in magnetic fusion research with tokamaks, as these instabilities can damage plasma-facing components, particularly divertor plates. The mitigation or suppression of large Elms is a critical issue for successful operation of ITER. Goal for ANEMOS is to develop and improve numerical tools in order to simulate physical mechanisms of Elms and qualifies some strategies for their control. We then need to design efficient numerical strategies on the most advanced computers available to contribute to the science base underlying of proposed burning plasma tokamak experiments such as ITER.

- ANR IODISEE : IOnospheric DIsturbanceS and SatEllite-to-Earth communications. http://iodissee.math.cnrs.fr/project/index.html. In this ANR project, CASTOR will address the use of data-models coupling method to identify the input model parameters (especially, the initial data for the electronic density).

8.1.2. Federation on Magnetic Confinement Fusion Projects

- FR FCM (Federation on Magnetic Confinement Fusion) project within Euratom-CEA association, "Reconstruction, simulation and control of plasma equilibrium"
- FR FCM (Federation on Magnetic Confinement Fusion) project within Euratom-CEA association, “Two-fluid numerical modelling of edge plasma in tokamak; Application to ITER”.

8.2. European Initiatives

8.2.1. Collaborations with Major European Organizations

EFDA (European Fusion Development Agreement)

EFDA ITM Task Force (Integrated Tokamak Modelling) CEDRES++ and Equinox are developped within the framework of the Task Force on Integrated Tokamak Modelling of the European Fusion Development Agreement.

EFDA (European Fusion Development Agreement)

JOREK, BOUT++ non-linear MHD modelling of MHD instabilities and their control in existing tokamaks and ITER

8.3. International Initiatives

8.3.1. Participation In other International Programs

8.3.1.1. Euromediterranée 3+3 Medlagoon program

Participants: Hervé Guillard, Marco Bilanceri.

The goal of the Medlagoon project (https://project.inria.fr/medlagoon/en) is to contribute to the design of simulations tools aimed to the integrated mathematical modeling of Mediterranean lagoons ranging from hydrodynamics and sediment transport modeling to biological models for phyto and zoo-plankton. This program associates CASTOR with the Mohamedia Engineering school and the university of Oujda in Morocco, the University of Pisa (Italy), the Polytechnic school of Tunis in Tunisia, the University of Paris 13, The Ain Sham University in Egypt and the Department of Applied Mathematics, University of Crete in Greece.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

8.4.1.1. Internships

- Pavla Frankova, University of Pilzen : Algebraic Multigrid Solvers. In the framework of a collaboration on algebraic multigrid solvers with Petr Vanek and Roman Kuzel of the University of Pilzen, Cezch Republic, Pavla Frankova PhD student in Pilzen has visited CASTOR in November.
- Abdou Hafar, Ecole Mohamedia Ingénieur, Rabat : In the framework of the Medlagoon program, Abou Hafar PhD student has visited CASTOR in November to work on meshless methods.

COATI Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR

8.1.1.1. ANR Blanc AGAPE, 10/2009-09/2013

Participants: David Coudert, Frédéric Havet, Ana Karolinna Maia de Oliveira, Nicolas Nisse, Stéphane Pérennes, Michel Syska.

The project AGAPE (Parameterized and exact graph algorithms) is led by COATI and implies also LIRMM (Montpellier) and LIFO (Orléans). The aim of AGAPE is to develop new techniques to solve exactly NP-hard problems on graphs. To do so, we consider two approaches which are closely related ways to reduce the combinatorial explosion of NP-hard problems: moderately exponential exact algorithms and fixed-parameter tractability.

(http://www-sop.inria.fr/mascotte/Contrats/Agape.php)

8.1.2. GDR Actions

8.1.2.1. Action ResCom, ongoing (since 2006)

Réseaux de communications, working group of GDR ASR, CNRS.

(http://rescom.asr.cnrs.fr/)

8.1.2.2. Action Graphes, ongoing (since 2006)

Action Graphes, working group of GDR IM, CNRS.

(http://www.labri.fr/perso/raspaud/pmwiki/pmwiki.php)

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. EULER

Participants: David Coudert, Luc Hogie, Aurélien Lancin, Bi Li, Nicolas Nisse, Stéphane Pérennes, Issam Tahiri.

Title: EULER (Experimental UpdateLess Evolutive Routing)

Type: COOPERATION (ICT)

Defi: Future Internet Experimental Facility and Experimentally-driven Research

Instrument: Specific Targeted Research Project (STREP)

Duration: October 2010 - June 2014

Partners: Alcatel-Lucent Bell (leader) (Antwerp, Belgique), iMind (Ghent, Belgium), UCL (Louvain, Belgium), RACTI (Patras, Grece), UPC (Barcelona, Spain), UPMC (ComplexNetworks, Paris 6), Inria (COATI, GANG, CEPAGE).Coordinator: ALCATEL-LUCENT (Belgium)

STREP EULER (Experimental UpdateLess Evolutive Routing) is part of FIRE (Future Internet Research and Experimentation) objective of FP7. It aims at finding new paradigms to design, develop, and validate experimentally a distributed and dynamic routing scheme suitable for the future Internet and its evolution. COATI is the leader of WP3 on Topology Modelling and Routing scheme experimental analysis.

See also: http://www-sop.inria.fr/mascotte/EULER/wiki/

8.2.2. Collaborations in European Programs, except FP7

8.2.2.1. PHC PROCOPE (with Discrete Optimization group of RWTH Aachen University), 01/2011-06/2013

Participants: Christelle Molle-Caillouet, David Coudert, Alvinice Kodjo, Issam Tahiri, Truong Khoa Phan.

Bilateral collaboration funded by the french ministry of foreign affairs (MAE), the french ministry of research and education (MESR), and the Deutscher Akademischer Austauschdienst (DAAD). The funding covers scientific visits.

"Défis algorithmiques dans les réseaux de communication". The purpose of the project is to exchange expertise between the discrete optimization group of RWTH Aachen University and the COATI team at Inria Sophia-Antipolis and to address algorithmic problems in communication networks.

8.3. International Initiatives

8.3.1. Inria Associate Teams

8.3.1.1. AlDyNet

Title: Algorithm for large and Dynamic Networks

Inria principal investigator: Nicolas Nisse

International Partner (Institution - Laboratory - Researcher):

Universidad Adolfo Ibañez, Santiago, Chile
Facultad de Ingeniería y Ciencias
Karol Suchan

Duration: 2013 - 2015

See also: http://team.inria.fr/coati/projects/aldynet/

The main goal of this Associate Team is to study the structure of networks (modeled by graphs) to design both efficient distributed algorithms and reliable network topologies suitable to applications. We are interested both in large-scale (Facebook, Internet, etc.) and in smaller networks (e.g., WDM) that handle heavy traffic. More precisely, we aim at designing new techniques of distributed and localized computing to test structural properties of networks and to compute structures (e.g., decompositions) to be used in applications. Concerning the applications, we will first focus on routing and subgraph packing problems.

There are two main objectives:

- Find efficient localized algorithms to test certain graph properties or to prove that no such algorithms exist. We will formalize several distributed computing models and analyze which properties can and which cannot be tested in them.
- Define graph properties – computable or approximable in distributed systems – such as structures/decompositions/representations. The driving idea is to combine several well studied graph properties in order to obtain more specific structures which we hope to be more easily computable.

To verify the practical efficiency of our results, the designed algorithms will be implemented and compared to existing ones. For this purpose, a particular effort will be put to design and implement algorithms to generate graphs that satisfy properties of interest, in order to use them to test the algorithms.

The originality of the proposal is to combine powerful tools of graphs theory (e.g., FPT complexity) and of combinatorial optimization (Mixed Integer Programming) with distributed computing. One challenge here is to balance between the degree of locality of desired algorithms and the relevance of properties that may be computed.

8.3.2. Inria International Partners

8.3.2.1. ANR International Taiwan GRATEL, 01/2010 – 12/2013

Participants: Jean-Claude Bermond, Frédéric Havet.

GRATEL (Graphs and Telecomunications) has been started in collaboration with LABRI Bordeaux, UJF Grenoble and three partners in Taiwan: Sun Yat-sen University, the National Taiwan University and Academia Sinica.

(https://gratel.labri.fr/pmwiki.php?n=Main.HomePage)

8.3.3. Participation In other International Programs

Inria FUNCAP (Inria-FAP): ALERTE (ALgorithmes Efficaces pour les Réseaux de TElécommunications), with Pargo Team, Universidade Federal do Ceará, Brazil, 07/2011-07/2013.

Action ECOS-SUD: ALgorithmes Distribués pour le calcul de la structure des réseaux, with Chile, 2013-2015.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

Jørgen Bang-Jensen: Univ. Southern Denmark, Odensee, Denmark, from October 11 to November 2, 2013 (3 weeks);

Gianlorenzo D'Angelo: Univ. degli studi di Perugia, Italy, September 9-17, 2013 (2 weeks);

Xavier Défago: Japan Advanced Institute of Science and Technology, Nomi, Ishikawa, Japan, from September 16, 2013 to January 31, 2014 (4.5 months);

Mattia D'Emidio: Univ. L'aquila, Italy, from March 1 to April 30, 2013 (2 months);

Michele Flammini: Univ. of L'Aquila, Italy, from June 22 to July 13, 2013 (3 weeks);

Brigitte Jaumard: Concordia Univ., Montréal, Canada, February 11-22, 2013 (2 weeks);

Mejdi Kaddour: Univ. Oran, Algeria, December 6-13, 2013 (1 week);

Takako Kodate: Tokyo Woman's Christian Univ., Suginami-ku, Tokyo, Japan, from March 21 to April 4, 2013 (2 weeks);

Arie M.C.A. Koster: RWTH Aachen Univ., Germany, February 11-15, 2013 (1 week);

Claudia Linhares-Sales: UFC Fortaleza, Brazil, November 5-11, 2013 (1 week);

Euripides Markou: Univ. Thessaly, Volos, Greece, March 24th-31th (1 week);

Gianpiero Monaco: Univ. L'Aquila, Italy, September 1-8, 2013 (1 week);

Joseph Peters: Simon Frasier Univ., Vancouver, Canada, from January 20 to June 14, 2013 (5 months);

Guido Proietti: Univ. L'Aquila, Italy, September 1-9, 2013 (1 week);

Esteban H. Roman Catafau: Univ. Adolfo Ibañez, Chile, from September 7 to October 6, 2013 (1 month);

Karol Suchan: Univ. Adolfo Ibáñez, Chile, September 7-21, 2013 (2 weeks);

Amel Tandjaoui: Univ. Oran, Algeria, June 12 till July 13, 2013 (1 month);

Joseph Yu: Abbotsford and SFU, Vancouver, Canada, from March 1 to April 19, 2013 (1 month 1/2);

8.4.1.1. Internships

Guillaume Ducoffe: ENS Cachan, from March 18, 2013 until August 31, 2013, and since October 15, 2013;

Rennan Ferreira Dantas: Univ. Federal do Ceará, Brazil, since November 2013;

Klaus Christoph Jaschan Little: Univ. Adolfo Ibañez, Chile, since December 2013;

Ioannis Lamprou: National and Kapodistrian Univ. Athens, Greece, from March 2013 until September 2013;

Christos Papageorgakis: Univ. Central Greece, from January 2013 until July 2013;

Phablo Fernando Soares Moura: Univ. São Paulo (USP), Brazil, from March 2013 until July 2013;

Claudio Soares De Carvalho Neto: Univ. Federal do Ceará, Brazil, since November 2013;

8.4.2. Visits to International Teams

J. Araújo and A.K. Maia: Visit to Simon Fraser Univ., Vancouver, Canada (January 11-February 10, 2013).

J-C. Bermond: LRI, Orsay (March 29, 2013); LIRMM, Montpellier (April 16, 2013);

D. Coudert: Visit to Univ. Adolfo Ibañez (part of EA AlDyNet), Santiago Chile (November 15-30, 2013);

F. Havet: Visit to LIRMM, Univ. Montpellier 2, (December 9-11, 2013);

A. Kodjo: Visit to Concordia Univ., Montreal, Canada, (August 1st-September 1st, 2013);

F.Z. Moataz and B. Li: Visit to Univ. Adolfo Ibañez, Santiago, Chile, (November 14-December 12, 2013);

N. Nisse: Visit to Univ. Adolfo Ibañez (part of EA AlDyNet), Santiago Chile (November 15-December 1st, 2013); Visit to Univ. Perugia, Italy (October 20-25, 2013)

COFFEE Project-Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. ANR

The ANR-project Monumentalg, led by M. Ribot, is devoted to the modeling and simulation of biological damage on monuments and algae proliferation.

7.1.2. National and European networks

- GdR MoMas.

  The research group MoMaS (Mathematical Modeling and Numerical Simulation for Nuclear Waste Management Problems) has activities centered around scientific computing, design of new numerical schemes and mathematical modelling (upscaling, homogenization, sensitivity studies, inverse problems,...). Its goal is to coordinate research in this area, as well as to promote the emergence of focused groups around specific projects
- S. Junca is involved in the GdR-e "Wave Propagation in Complex Media for Quantitative and non Destructive Evaluation".
- GdR EGRIN is a newly created CNRS-network, devoted to gravitational flows and naturals risks; Coffee is among the members of this network.

7.2. International Initiatives

7.2.1. Inria Associate Teams

As of March 2014, the project CoKLyCo will start: this is a joint research program with the group of F. Filbet from the Math. Dept. of the University of Lyon and the team of K. Aoki from the Dept. of Mechanical Engineering at Kyoto University. The project is concerned with fluid and kinetic model for some rarefied gases.

7.2.1.1. Informal International Partners

Quite recently, S. Junca has started a collaboration with Mathias Legrand, from the Mechanical Engineering department at Mc Gill, Montréal with the supervision of the internship of a master student (S. Heng, 6 months, June-Nov. 2013). Furthermore, S. Junca is an active member of the European network "Wave propagation in complex media for quantitative and non destructive evaluation" [1]

S. Krell has a collaboration with Martin Gander (University of Geneva, Switzerland) on domain decomposition methods, adapted to DDFV discretizations.

M. Ribot started a collaboration with Roberto Natalini a couple of years ago. Connections with experts in Firenze was the starting point of the research on biofilm formation and algae proliferation. M. Ribot and R. Natalini have also worked on new well-balanced strategy — the so-called AHO schemes — in order to preserve equilibria and to capture correctly large time solutions for complex PDEs system, without knowing explicitly the equilibrium solution. They have co-advised 2 PhD thesis.

Finally, we have many international collaborations, with variable peaks of activity, in our research networks: A. Vasseur (U. T. Austin), P.E. Jabin (Univ. Maryland), J.-A. Carrillo (Imperial College London), S. Jin (U. W. Madison and Jiao Tong Univ.), R. Aavatsmark (Univ. of Bergen), etc.

7.3. International Research Visitors

7.3.1. Visits of International Scientists

A. Vasseur, from UT Austin, J. A. Carrillo from ICL, Corrado Mascia from Sapienza, Università di Roma and Gabriella Puppo from Politecnico di Torino visited the team

[1] `http://www.gdre-us.cnrs-mrs.fr/spip.php?rubrique8`

COPRIN Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR

8.1.1.1. ID4CS project

Participant: Yves Papegay.

The ID4CS project, supported by French National Research Agency (ANR) through COSINUS program has the ambition to propose a modeling and simulation environment for designing complex systems such as aircrafts, based on a self-adaptive, distributed and open multi-agent architecture distributing the optimization process inside the agents.

As a partner of the project we are mainly involved in the definition of the use case on preliminary aircraft design, in collaboration with Airbus (6.2.1), in development of uncertainty analysis algorithms, and in automatic generation of agents based on models.

8.1.1.2. COGIRO project

Participants: Julien Alexandre Dit Sandretto, David Daney [correspondant], Jean-Pierre Merlet.

We are collaborating with LIRMM, LASMEA and TECNALIA for the development of large scale wire-driven parallel robots [1]. We are especially involved in the calibration of a prototype developed by LIRMM and TECNALIA, see section 6.1.1.2 .

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. CABLEBOT

Type: COOPERATION

Instrument: Specific Targeted Research Project

Objective: to develop a new generation of modular and reconfigurable robots able to perform many different steps in the post-production of large-scale structures.

Duration: November 2011 - October 2014

Coordinator: Ms. Mariola Rodríguez (TECNALIA, Spain)

Partner: TECNALIA (Spain), CNRS-LIRMM, FRAUNHOFFER-IPA, UDE, Inria, EADS, ACCIONA, VICINAY

Inria contact: Jean-Pierre Merlet

Abstract: The CABLEBOT project [2] deals with a novel methodology for designing, developing and evaluating cable robots customized for the automation in large-scale auxiliary processes. Parallel cable robots extend the payloads and workspace of conventional industrial robots by more than two orders of magnitude. The main objective is to develop a new generation of modular and reconfigurable robots able to perform many different steps in the post-production of large-scale structures. Three key technologies will be developed: a) Design of Cable Robot: Software tools to design the layout and geometry of cable robots, b) Industrial Process Planning: Simulation of cable robots

[1] http://www.lirmm.fr/cogiro/
[2] http://www.cablebot.eu/

to verify the operation of cable robots in environments with large-scale structures c) Control Algorithms and Systems: Distributed control and kinematic transformation to operate modular cable robots. Two application examples are targeted in close cooperation to industry: aeronautical applications of maintenance and the handling of construction beams. In both cases existing automation can hardly be used due to maneuverability of heavy and big parts and the risk associated. The results are feasible for many other fields including large-workspace movements of products, with impact in logistics, transport, and warehousing. The exploitation and commercialization of CABLEBOT are driven by VICINAY CEMVISA, the application of industrial scenarios, two end-users of different sectors - EADS and ACCIONA - will automate their currently manual post-production. TECNALIA provides the technology for simulation in terms of productivity, cost, safety and robustness, whereas the design of the robots is in charge of LIRMM and Inria. IPA and UDE are in charge of the control algorithms, on distributed and force control of redundant systems. Benefits include an increase of production efficiency, a wider range of products, light and reconfigurable structure mechanisms and adaptable and more flexible operator assistance systems.

8.2.1.2. RAPP

Type: COOPERATION

Instrument: Specific Targeted Research Project

Objective: Robotic Applications for Delivering Smart User Empowering Applications

Duration: December 2013-December 2016

Coordinator: CERTH/ITI

Partner: CERTH/ITI(Greece), Inria, WUT (Poland), ORTELIO (UK), ORMYLIA (Greece), INGEMA (Spain)

Inria contact: David Daney, Jean-Pierre. Merlet, Manuel Serrano

Abstract: s our societies are affected by a dramatic demographic change, in the near future elderly and people requiring support in their daily life will increase and caregivers will not be enough to assist and support them. Socially interactive robots can help to confront this situation not only by physically assisting people but also functioning as a companion. The increasing sales figures of robots are pointing that we are in front of a trend break for robotics. To lower the cost for developers and to increase their interest on developing robotic applications, the RAPP introduces the idea of robots as platforms. RAPP (Robotic Applications for Delivering Smart User Empowering Applications) will provide a software platform in order to support the creation and delivery of robotics applications (RAPPs) targeted to people at risk of exclusion, especially older people. The open-source software platform will provide an API that contains the functionalities for implementing RAPPs and accessing the robot's sensors and actuators using higher level commands, by adding a middleware stack with added functionalities suitable for different kinds of robots. RAPP will expand the computational and storage capabilities of robots and enable machine learning operations, distributed data collection and processing, and knowledge sharing among robots in order to provide personalized applications based on adaptation to individuals. The use of a common API will assist developers is creating improved applications for different types of robots that target to people with different needs, capabilities and expectations, while at the same time respect their privacy and autonomy, thus the proposed RAPP Store will have a profound effect in the robotic application market. The results of RAPP will be evaluated through the development and benchmarking of social assistive RAPPs, which exploit the innovative features (RAPP API, RAPP Store, knowledge reuse, etc.) introduced by the proposed paradigm.

8.3. International Initiatives

8.3.1. Informal International Partners

Our collaboration are described in the figure 1 .

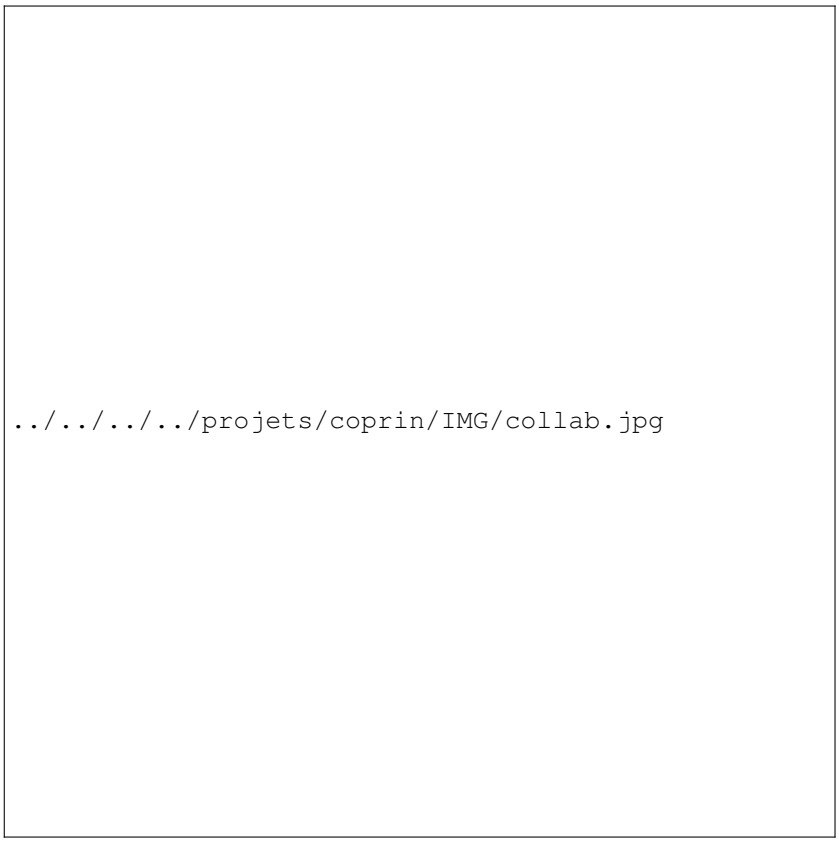

Figure 1. COPRIN collaboration. JP:joint project, JS: joint stay, Jphd: joint PhD students

DEMAR Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. Appel d'Offre Interne (AOI) CGS Merri (CHU Montpellier)

Development and evaluation of a freezing detection system for people subject to the Parkinson disease : CHU Montpellier - UM1 M2H (Montpellier) - DEMAR

8.1.2. Labex NUMEV

Optimization of the sitting to stand-up transfer under FES for paraplegic people : preliminary study.

8.1.3. Running CPP protocols (Comité de Protection des Personnes)

- Optimisation du transfert assis-debout sous électro myostimulation fonctionnelle du patient paraplégique : Etude préliminaire, PROPARA, Montpellier. CPP Sud Méditerranée III - ID RCB : 2010-A00808-31 + Amendement.
- Détection et quantification du freezing chez le sujet parkinsonien CHU Montpellier, A. Balmes. CPP Sud Méditerranée 4 - étude qualifiée "soins courants".
- Observation du cycle de marche chez des patients hémiplégiques dans le but d'améliorer le déclenchement de la stimulation électrique fonctionnelle CHU Nîmes, Grau du Roi. CPP Sud Méditerranée III
- Mise au point d'une stratégie pour le stimulation sélective chez le lapin. Laboratoire de recherches chirurgicales Institut de Biologie, Université Montpellier I. Comité d'Ethique pour l'Expérimentation Animale Languedoc-Roussillon

8.2. National Initiatives

8.2.1. DEMAR / MXM Innovation Lab "SoftStim" project

Participants: David Guiraud, David Andreu.

Inria Innovation-Lab "SoftStim" project (2011-2014). 1 engineer (3 y.), 20keuros.

The aim of this Inria's national initiative is to favor the scientific collaboration and technological transfer of the innovation between DEMAR and MXM.

The aim of this project is to prototype concepts conjointly patented like stimulation unit 's embedded sequencer and processor (new set of instructions), and implantable FES controller with its dedicated software environment.

8.2.2. Cosinus ANR - SoHuSim

Participants: Benjamin Gilles, Mitsuhiro Hayashibe, David Guiraud, Maxime Tournier.

Project SoHuSim on modeling muscle tissue during contraction in 3D movements using SOFA software and functional modeling of the organs. 150 kE. Partners: Inria Evasion, Tecnalia, HPC, CHU Montpellier (Oct. 2010 - Oct. 2014).

8.2.3. ADT SENSAS - SENSBIO

Participants: Christine Azevedo-Coste, David Andreu, Daniel Simon.

SENSAS is an Inria ADT (Actions de Développement Technologique), implying several Inria project teams on the “SENSor network ApplicationS” theme. SENSAS aims to propose applications based on wireless sensor and actuator network nodes provided from the work done around senslab and senstools preliminary projects. SENSAS is organized around the following work packages :

- SensRob : Robotics applications
- SensBio : Bio-Logging applications
- SensMGT : Wireless sensor/actuator network management/configuration applications
- SensBox : Wireless sensor/actuator network simulation applications and tools

Our team is mainly implied in the SensBio work package, in particular for the following applications: Spinal Cord Injured Patients FES-Assisted Sit to Stand, Post-Stroke Hemiplegic Patient FES-correction of drop foot, Gait analysis of parkinson freezing and Motion analysis of longterm race data.

8.2.4. Programme de recherche en qualité hospitaliere (PREQHOS)

Participants: Leader: Jean-Christophe Lucet [GH Bichat - Claude Bernard], Christine Azevedo-Coste, Eric Fleury [Inria DANTE], Bruno Grandsebastien [CHRU Lille].

Project: Surgery room behaviour and impact on infectious risks (ARIBO : Attitudes et Risque Infectieux au Bloc Operatoire)

8.2.5. INTENSE project

Participants: David Guiraud, Pawel Maciejasz, Olivier Rossel, Christine Azevedo-Coste, David Andreu, Fabien Soulier.

INTENSE (Initiative Nationale Technologique d’Envergure pour une NeuroStimulation Evoluée) is a PIA-PSPC Project (Programme Investissement d’Avenir, Projets RD Structurants des Pôles de Compétitivité) [2012-2018]. The aim of this project is to develop new implantable devices, based on neurostimulation, for heart failure.

Partners of this project are: DEMAR, SORIN CRM, MXM-Obélia, 3D plus, CEA-Leti, INRA Rennes, INSERM Rennes, HEGP, CHU Rennes.

8.3. European Initiatives

8.3.1. FP7 European project TIME

Participants: David Guiraud, David Andreu, Fabien Soulier, Pawel Maciejasz.

(2008-2013). 375keuros, "*Transverse, Intrafascicular Multichannel Electrode system for induction of sensation and treatment of phantom limb pain in amputees*".

Partners : AAU (Aalborg, Denmark), MXM (Vallauris, France), SSSA (Pisa, Italy), IMTEK (Freiburg, Germany), UAB (Barcelona, Spain), UCBM (Roma, Italy), IUPUI (Indianapolis, USA).

http://www.project-time.eu/

8.3.2. FP7 European project EPIONE

Participants: David Guiraud, David Andreu, Fabien Soulier, Pawel Maciejasz.

(2013-2017) "*Natural sensory feedback for phantom limb pain modulation and therapy*,

Partners: AAU (Aalborg, Denmark), École polytechnique fédérale de Lausanne (EPFL), IUPUI (Indianapolis, USA), Lund University (LUNDS UNIVERSITET), MXM (Vallauris, France), Novosense AB (NS), IMTEK (Freiburg, Germany), UAB (Barcelona, Spain), Aalborg Hospital, Universita’ Cattolica del Sacro Cuore (UCSC), Centre hospitalier Universitaire Vaudois (CHUV)

http://project-epione.eu/

8.4. International Initiatives

8.4.1. Participation In other International Programs

8.4.1.1. STIC AmSud

Title: CARAT (Computer Aided Rehabilitation Algorithms and Tools)

Inria principal investigator: Mitsuhiro Hayashibe

International Partner (Institution - Researcher):

Universidade de Brasília (UnB,Brazil) - Antônio P.L. Bó, Geovany Borges

Pontificia Universidad Católica del Perú (PUCP,Brazil) - Dante Elias

Duration: 2012 - 2013

Throughout the world there is an increasing need for better technologies for rehabilitation and assistance. These new solutions must present improved performance in terms of therapy effectiveness, while at the same time minimizing the corresponding costs. In this scenario, computer-aided methods represent a promising alternative for the challenges currently faced by the rehabilitation domain. Within this collaborative research project, we focus on the following research topics: - Algorithms for human motion analysis for both clinical and residential settings based on portable and external sensing technologies - Sensory feedback devices to improve effectiveness on rehabilitation procedures - Robotic platforms for rehabilitation - Software development for telerehabilitation

8.5. International Research Visitors

8.5.1. Visits of International Scientists

- Prof. Dante Elias (Professor, Pontificia Universidad Católica del Perú) visited and presented his work on "Characteristics of a walking simulator with parallel manipulators" (7th, Nov 2013).

8.5.1.1. Internships

David Andreu supervised Milan Demarcq on "Mesure et Optimisation de la consommation de systèmes numériques implantables", Engineer final internship, from March. 2013 to Sep. 2013.

David Guiraud supervised Charles Juillet on «Transmission d'énergie et de données à un implant via un câble bifilaire », Engineer final internship, from March. 2013 to Sep. 2013.

David Andreu supervised Arthur Hiairrassary on "Architecture logicielle temps-réel d'un contrôleur de SEF implantable", Projet Industriel de Fin d'Etudes (engineer final year project), from Sep. 2013 to Feb. 2014.

David Andreu supervised Joannick Azama on "Implémentation d'un protocole application multi-charge pour réseau de SEF sans-fil", Projet Industriel de Fin d'Etudes (engineer final year project), from Sep. 2013 to Feb. 2014.

David Andreu supervised Chams Jied on "Architecture logicielle d'un contrôleur temps-réel de stimulation électrique fonctionnelle", Projet Industriel de Fin d'Etudes (engineer final year project), from Sep. 2013 to Feb. 2014.

David Andreu supervises Guillaume Magro. "Spécification et prototypage d'un contrôleur de SEF implantable". Industrial Informatics Engineer, Inria Expert Engineer contract (3 years contract, Inria).

Daniel Simon supervised Jonathan Peguet on "Attitude Reconstruction of an Inertial Measurement Unit using IMUSim Software", IFMA (Clermont-Ferrand) engineer final year project, from Apr. to Sep. 2013.

Mitsuhiro Hayashibe supervised Sourav Chandra on "Dynamic modeling of fatigue induced hand tremor", PhD internship, Svaagata.eu: experience Europe as an Indian Erasmus Mundus, Indian Institute of Technology Madras, India, from Sep. 2013 to Feb. 2014.

8.5.2. Visits to International Teams

- Mitsuhiro Hayashibe visited Pontificia Universidad Católica del Perú for STIC Amsud - CARAT project and made a seminer on "Modeling and Control for Neuroprosthetic Systems and Rehabilitation" (15th May 2013 -25th May 2013).
- Mitsuhiro Hayashibe was Visiting Researcher at RIKEN BSI-TOYOYA research institute and worked on "Tacit Motor learning for rehabilitation" (Jul.-Aug. 2013).

DIANA Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

- **PFT** (2011-2014) is a DGCIS funded project, in the context of the competitivity cluster SCS, whose aim is to provide to PACA region industrials wishing to develop or validate new products related to future mobile networks and services and M2M application, a networking infrastructure and tools helpful for development, test and validation of those products. Other partners : 3Roam, Audilog Groupe Ericsson, Ericsson, Eurecom, Inria, iQsim, MobiSmart, Newsteo, OneAccess, Orange Labs, Pôle SCS, ST Ericsson, Telecom Valley. Our contribution is centred around providing a test methodology and tools for wireless networks experimentation.

8.2. National Initiatives

8.2.1. ANR

- **ANR FIT** (2011-2018): FIT (Future Internet of Things) aims to develop an experimental facility, a federated and competitive infrastructure with international visibility and a broad panel of customers. It will provide this facility with a set of complementary components that enable experimentation on innovative services for academic and industrial users. The project will give French Internet stakeholders a means to experiment on mobile wireless communications at the network and application layers thereby accelerating the design of advanced networking technologies for the Future Internet. FIT is 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. The project will benefit from a 5.8 million euro grant from the French government. Other partners are UPMC, IT, Strasbourg University and CNRS. See also http://fit-equipex.fr/.
- **ANR F-Lab** (2011-2013): ANR funded project on the federation of computation, storage and network resources, belonging to autonomous organizations operating heterogeneous testbeds (e.g. PlanetLab testbeds and Sensors testbeds). This includes defining terminology, establishing universal design principles, and identifying candidate federation strategies. Other partners : UPMC, A-LBLF and Thales.
- **ANR DISCO** (2013-2016): DISCO (DIstributed SDN COntrollers for rich and elastic network services) aims to explore the way how Software Defined Networking changes network monitoring, control, urbanisation and abstract description of network resources for the optimisation of services. The project works throughout experimentations and application use cases on the next generation of Software-Defined Networking solutions for large and critical distributed systems. The project will study the distribution of the current SDN control plane and the optimization of network operations that the integrated system view of cloud computing-based architectures allows.

8.3. European Initiatives

8.3.1. FP7 Projects

8.3.1.1. NOVI

Title: Networking innovations Over Virtualized Infrastructures

Type: COOPERATION (ICT)

Defi: CAPACITIES programme.

Instrument: Specific Targeted Research Project (STREP)

Duration: September 2010 - February 2013

Coordinator: NTUA (Greece)

Others partners: 13 european partners including GARR, ELTE, Cisco, etc.

See also: http://www.fp7-novi.eu/

Abstract: NOVI (Networking innovations Over Virtualized Infrastructures) research concentrates on efficient approaches to compose virtualized e-Infrastructures towards a holistic Future Internet (FI) cloud service. Resources belonging to various levels, i.e. networking, storage and processing are in principle managed by separate yet interworking providers. NOVI will concentrate on methods, information systems and algorithms that will enable users with composite isolated slices, baskets of resources and services provided by federated infrastructures.

8.3.1.2. Fed4Fire

Title: Federation for Future Internet Research and Experimentation

Type: COOPERATION (ICT)

Defi: FIRE programme.

Instrument: Integrating Project (IP)

Duration: October 2012 - October 2016

Coordinator: iMinds (Belgium)

Others partners: 17 european partners including iMinds, IT Innovation, UPMC, Fraunhofer, TUB, UEDIN, NICTA, etc.

See also: http://www.fed4fire.eu/

Abstract: Fed4FIRE will deliver open and easily accessible facilities to the FIRE experimentation communities, which focus on fixed and wireless infrastructures, services and applications, and combinations thereof. The project will develop a demand-driven common federation framework, based on an open architecture and specification. It will be widely adopted by facilities and promoted internationally. This framework will provide simple, efficient, and cost effective experimental processes built around experimenters' and facility owners' requirements. Insight into technical and socio-economic metrics, and how the introduction of new technologies into Future Internet facilities influences them, will be provided by harmonized and comprehensive measurement techniques. Tools and services supporting dynamic federated identities, access control, and SLA management will increase the trustworthiness of the federation and its facilities. A FIRE portal will offer brokering, user access management and measurements. Professional technical staff will offer first-line and second-line support to make the federation simple to use. The project will use open calls to support innovative experiments from academia and industry and to adapt additional experimentation facilities for compliance with Fed4FIRE specifications. A federation authority will be established to approve facilities and to promote desirable operational policies that simplify federation. A Federation Standardization Task Force will prepare for sustainable standardization beyond the end of the project. The adoption of the Fed4FIRE common federation framework by the FIRE facilities, the widespread usage by both academic and industrial experimenters, and the strong links with other national and international initiatives such as the FI-PPP, will pave the way to sustainability towards Horizon 2020.

8.3.1.3. OPENLAB

Title: OpenLab: extending FIRE testbeds and tools

Type: COOPERATION (ICT)

Defi: ICT 2011.1.6 Future Internet Research and Experimentation (FIRE)

Instrument: Integrated Project (IP)

Duration: September 2011 - January 2014

Coordinator: Université Pierre et Marie Curie (France)

Others partners: 18 European partners (including ETH Zurich, Fraunhofer, IBBT, TUB, UAM, etc.) and Nicta from Australia.

See also: http://www.ict-openlab.eu/

Abstract: OpenLab brings together the essential ingredients for an open, general purpose and sustainable large scale shared experimental facility, providing advances to the early and successful prototypes serving the demands of Future Internet Research and Experimentation.OpenLad partners are deploying the software and tools that allow these advanced testbeds to support a diverse set of applications and protocols in more efficient and flexible ways. OpenLab's contribution to a portfolio that includes: PlanetLab Europe (PLE), with its over 200 partner/user institutions across Europe; the NITOS and w-iLab.t wireless testbeds; two IMS telco testbeds that can connect to the public PSTN, to IP phone services, and can explore merged media distribution; an LTE cellular wireless testbed; the ETOMIC high precision network measurement testbed; the HEN emulation testbed; and the ns-3 simulation environment. Potential experiments that can be performed over the available infrastructure go beyond what can be tested on the current internet. OpenLab extends the facilities with advanced capabilities in the area of mobility, wireless, monitoring, domain interconnections and introduces new technologies such as OpenFlow. These enhancements are transparent to existing users of each facility. Finally, OpenLab will finance and work with users who propose innovative experiments using its technologies and testbeds, via the open call mechanism developed for FIRE facilities.

8.3.2. EIT KIC funded activities

Our project team was involved in 2013 in **three activities** funded by the EIT ICT Labs KIC:

Fitting, Future InterneT (of ThINGs) facility

The goal of this activity is to develop a testbed federation architecture that combines wireless and wired networks.

Software-Defined Networking (SDN)

The objective of this activity is to explore software-defined networking at different positions on the axis between basic flow-level processing (using OpenFlow for end-to-end flows) in controlled fixed networks and cooperation between mobile end nodes in the open wireless Internet (using opportunistic networking for resources communicated hop-by-hop).

Information-centric networking (ICN) experimentation

The goal of this activity is to define and implement an early validation environment for ICN proposals.

8.4. International Initiatives

8.4.1. Inria Associate Teams

8.4.1.1. COMMUNITY

Title: Message delivery in heterogeneous networks

Inria principal investigator: Thierry Turletti

International Partner (Institution - Laboratory - Researcher):

University of California Santa Cruz (United States) - School of Engineering - Katia Obraczka

Duration: 2009 - 2014

See also: http://inrg.cse.ucsc.edu/community/

This Inria - UC Santa Cruz Team investigates a number of research challenges raised by message delivery in environments consisting of heterogeneous networks that may be subject to episodic connectivity.

During the first three years of the COMMUNITY associate team, we have explored solutions to enable efficient delivery mechanisms for disruption-prone and heterogeneous networks (i.e. challenged networks). In particular, we have designed the MeDeHa framework along with the Henna naming scheme, which allow communication in infrastructure and infrastructure-less networks with varying degrees of connectivity. We have also proposed efficient routing strategies adapted to environment with episodic connectivity that take into account the utility of nodes to relay messages. The various solutions have been evaluated using both simulations and real experimentations in testbeds located at Inria and UCSC. These solutions have demonstrated good performance in challenged networks. However, the ossification of the Internet prevents the deployment of such solutions in large scale. So, in 2012 we decided to extend our collaboration in two research directions: (1) The exploration of the software-defined networking paradigm to facilitate the implementation and large scale deployment of new network architectures to infrastructure-less network environments, and (2) the design of innovative information-centric communication mechanisms adapted to challenged networks. In particular, we are designing mechanisms to p rovide flexible, efficient, and secure capacity sharing solutions by leveraging SDN in hybrid networked environments, i.e., environments that consist of infrastructure-based as well as infrastructureless networks. We are also investigating solutions to optimize caching in infrastructure and infrastructureless networks using SDN. We have also designed a content-optimal delivery algorithm, called CODA, for distributing named data over challenged networks.

8.4.1.2. SIMULBED

Title: SIMULBED: Large-Scale Simulation Testbed for Realistic Evaluation of Network Protocols and Architectures

Inria principal investigator: Walid DABBOUS

International Partner (Institution - Laboratory - Researcher):

Keio University (Japan) - Shonan-Fujisawa Campus - Osamu Nakamura

Duration: 2012 - 2014

See also: http://planete.inria.fr/Simulbed

Simulators and experimental testbeds are two different approaches for the evaluation of network protocols and they provide a varying degree of repeatability, scalability, instrumentation and realism. Network simulators allow fine grained control of experimentation parameters, easy instrumentation and good scalability, but they usually lack realism. However, there is a growing need to conduct realistic experiments involving complex cross-layer interactions between many layers of the communication stack and this has led network researchers to evaluate network protocols on experimental testbeds.

The use of both simulators and testbeds to conduct experiments grants a better insight on the behavior of the evaluated network protocols and applications. In this project, we focus on the design of SIMULBED, an experimentation platform that aims to provide the best of both worlds. Our project builds on the following state-of-the-art tools and platforms: the open source ns-3 network simulator and the PlanetLab testbed. ns-3 is the first network simulator that includes a mechanism to execute directly within the simulator existing real-world Linux protocol implementations and applications. Furthermore, it can be used as a real-time emulator for mixed (simulation-experimentation) network scenarios. PlanetLab is the well-known international experimental testbed that supports the development and the evaluation of new network services. It is composed of nodes connected to the Internet across the world, and uses container-based virtualization to allow multiple experiments running independently on the same node while sharing its resources.

The overall objective of the project is to design a platform to make easier the evaluation of network protocols, applications and proposals for the future Internet architecture, and to make this platform available to the networking research community. The SIMULBED evaluation platform aims to conduct easily mixed simulation-experimentation evaluation of networking protocols in a scalable way, while maintaining a high degree of realism and increasing controllability and reproducibility. It is based on the PlanetLab testbed, the ns-3 network simulator and the NEPI unified programming environment developed in our team to help in simplifying the configuration, deployment and run of network scenarios on the platform. Within this collaboration, we are enhancing the support of emulation in the ns-3 network simulator through Direct Code Execution (DCE) and are extending the functionalities of NEPI to fit the needs of SIMULBED. For example, we extended the DCE and NEPI frameworks to conduct easily and in a more reaslitic way evaluation of the CCNx information-centric networking architecture through ns-3 and the PlanetLab testbed.

8.4.2. Inria International Labs

- CIRIC: Our project-team was involved in the definition of the topics for the Network and Telecom R&D line of the (the Communication and Information Research and Innovation Center - CIRIC), the Inria research and innovation centre in Chili. In this context, we will extend our collaboration with Universidad Diego Portales, Chile.

8.5. International Research Visitors

8.5.1. Visits of International Scientists

8.5.1.1. Visiting PhDs

Ilaria Cianci, Visiting PhD student (from Nov 2012 until Aug 2013)

Subject: Content Centric Networking

Institution: Politecnico di Bari, Italy

8.5.1.2. Internships

Alexandros Kouvakas (from May 2013 until Oct 2013)

Subject: An OpenFlow framework for integrated simulation and live experimentation

Institution: National and Kapodistrian University of Athens

Adel Aljalam (from Mar 2013 until Aug 2013)

Subject: Assessing Internet access quality by active measurements

Institution: Ubinet Master, University of Nice Sophia-Antipolis

Takai Eddine Kennouche (from Feb 2013 until May 2013)

Subject: Realistic Simulation of Sensor Networks - Contiki over ns-3

Institution: Institut National des Télécommunications et des TIC - Oran, Algeria.

Nicoleta Oita (from Mar 2013 until Aug 2013)

Subject: Privacy in mobile networks

Institution: Ubinet Master, University of Nice Sophia-Antipolis

Xiuhui Ye (from May 2013 until Nov 2013)

Subject: How to Network in Online Social Networks

Institution: Politecnico di Torino

8.5.2. Visits to International Teams

Alina Quereilhac, Visiting PhD student PARC in Palo Alto, USA

Period: From June to September 2013

Subject: Evaluating costs of CCNx overlays on the Internet

Thierry Turletti and Bruno Nunes Astuto, Visiting researchers to University of California at Santa Cruz

Period: One week in March 2013

Subject: Community Associated team

Bruno Nunes Astuto Visiting researchers to University of California at Santa Cruz

Period: One month in July 2013

Subject: Community Associated team

Thierry Turletti, Alina Quereilhac and Emilio Mancini, Visitors to NICT, Japan

Period: One week in October 2013

Subject: Simulbed associated team

FOCUS Project-Team

7. Partnerships and Cooperations

7.1. National Initiatives

- AEOLUS (Mastering the Cloud Complexity) is an ANR-ARPEGE project started on December 2010 that will finish on December 2014. AEOLUS studies the problem of installation, maintenance and update of package-based software distributions in cloud-based distributed systems. The problem consists of representing the dependencies of packages and the inter-relationships among the services, in such a way that starting from a declarative description of the application to be deployed on the cloud, it is possible to automatically compute the resources (ie. virtual machines) to be acquired, and the allocation of such resources to the software services needed to run the application. Main persons involved: Gabbrielli, Lascu, Mauro, Sangiorgi, Zavattaro.
- REVER (Programming Reversible Recoverable Systems) is an ANR project that started on 1st December 2011 and with a 48-month duration. REVER aims to study the possibility of defining semantically well-founded and composable abstractions for dependable computing on the basis of a reversible programming language substrate, where reversibility means the ability to undo any distributed program execution, possibly step by step. The critical assumption behind REVER is that by adopting a reversible model of computation, and by combining it with appropriate notions of compensation and modularity, one can develop systematic and composable abstractions for recoverable and dependable systems. Main persons involved: Giachino, Lienhardt, Lanese, Laneve, Zavattaro.
- The ANR project PACE (Processus non-standard: Analyse, Coinduction, et Expressivité) has started in 2013. The project targets three fundamental ingredients in theories of concurrent processes, namely coinduction, expressiveness, and analysis techniques. The project aims at processes that are beyond the realm of "traditional" processes. Specifically, the models studied exhibit one or more of the following features: probabilities, higher-order, quantum, constraints, knowledge, and confidentiality. These models are becoming increasingly more important for today's applications. Coinduction is intended to play a pivotal role. Indeed, the approaches to expressiveness and the analysis techniques considered in the project are based on coinductive equalities. Main persons involved: Hirschkoff (project coordinator), Dal Lago, Lanese, Sangiorgi, Zavattaro.

7.2. European Initiatives

7.2.1. FP7 Projects

- ENVISAGE (Engineering Virtualized Services) is a EU FP7 project, with starting date October 1st, 2013, and with a 3-year duration. The project is about model-based development of virtualized services, including tool support for resource analysis. Most Focus members are involved.
- Hats (Highly Adaptable and Trustworthy Software using Formal Models) is an EU Integrated Project from FP7, started March 2009 and with a 4 year duration. Hats studies formal methods for obtaining high adaptability combined with trustworthiness in the setting of object-oriented languages and software product lines. Most Focus members are involved.
- PLATFORM (Practical Light Types for Resource Consumption) is a Marie Curie IOF project from FP7, started July 2011 with a three-year span. It involves one Focus member, Gaboardi, in research work at University of Pennsylvania and in Bologna. Project aim is the development of a practical programming language with information, in the form of dependent types, about the resources needed by programs during their execution, and where type checking a program will naturally correspond to exhibiting a certification of its resource consumption.

  Gaboardi has been in Philadelphia till July 2013, and then in Bologna till October 2013. (He has then moved to Dundee, where he has obtained a tenure-track position.)

7.2.2. Collaborations in European Programs, except FP7

- The ICT COST Action BETTY (Behavioural Types for Reliable Large-Scale Software Systems), initiated in October 2012 and with a four-year duration, will use behavioural type theory as the basis for new foundations, programming languages, and software development methods for communication-intensive distributed systems. Behavioural type theory encompasses concepts such as interfaces, communication protocols, contracts, and choreography. Main persons involved: Bravetti, Giachino, Lanese, Laneve, Mauro, Sangiorgi, Zavattaro.
- In the context of the EIT activity "HCI Technologies for the Digital World", funded with 23000 euro, we have worked to the technical part of the EIT ICT Labs Summer School, Intelligent Services for Digital Cities (ISDC-2013), which has been held in Trento in September 2003 (http://www.trentorise.eu/education/intelligent-services-digital-cities-isdc-2013-summer-school).

  In particular we developed a SaaS component, called WSOA, to our cloud oriented framework JSOA. WSOA can publish a set of APIs for external usage which are selected from those deployed into the PaaS layer (PaaSSOA). APIs are collected by exploiting the aggregation mechanism of Jolie and then deployed into a Jolie web server (Leonardo). They can be published by defining different protocols/formats such as http/soap, http/json, http/POST/xml, and so on. Thanks to WSOA we also developed a plugin for the SATIN project where the published APIs can be automatically imporyed into SATIN console and used for creating web based mobile applications.

  To provide a comprehensive tool for the students of the smart city summer school, we developed a wrapper for the CKAN platform in order to import all the CKAN APIs into PaaSSOA. In such a way, it is now possible to perform calls to the CKAN platfrom by exploiting Jolie services deployed into PaaSSOA.

  Main persons involved: Gabbrielli, Guidi.

7.2.3. Collaborations with Major European Organizations

We list here the cooperations and contacts with other groups, without repeating those already listed in previous sections.

- ENS Lyon (on concurrency models and resource control). Contact person(s) in Focus: Dal Lago, Gaboardi, Martini, Sangiorgi. Some visit exchanges during the year, in both directions. One joint PhD supervision (J.-M. Madiot).
- Inria EPI Spades (on models and languages for components, reversibility). Contact person(s) in Focus: Lanese.
- Laboratoire d'Informatique, Université Paris Nord, Villetaneuse (on implicit computational complexity). Contact person(s) in Focus: Dal Lago, Gaboardi, Martini. An Italian PhD student (Marco Solieri) is working on his PhD thesis with joint supervision (Martini, Guerrini).
- Institut de Mathématiques de Luminy, Marseille (on lambda-calculi, linear logic and semantics). Contact person(s) in Focus: Dal Lago, Martini. One joint PhD supervision (Michele Alberti).
- Team PPS, University of Paris-Diderot Paris 7 (on logics for processes, resource control). Contact person(s) in Focus: Dal Lago, Gaboardi, Martini, Sangiorgi. Some short visits in both directions during the year.
- IRILL Lab, Paris (on models for the representation of dependencies in distributed package based software distributions). Contact person(s) in Focus: Lascu, Mauro, Zavattaro. Some short visits in both directions during the year.
- EPI Carte, Inria-Nancy Grand Est and LORIA (on implicit computational complexity). Contact person(s) in Focus: Dal Lago,Gaboardi. Some visits during 2013.
- LMU Munich (M. Hofmann) (on Implicit computational complexity and IntML). Contact person(s) in Focus: Dal Lago.

- IMDEA Software, Madrid (G. Barthe) (on Implicit computational complexity for cryptography). Contact person(s) in Focus: Dal Lago. Some visits during 2003.
- Facultad de Informatica, Universidad Complutense de Madrid (on web services). Contact person(s) in Focus: Bravetti. Bravetti is an external collaborator in the project "ESTuDIo: ESpecificacion y Testing de sistemas altamente DIstribuidos" (Specification and Testing of Highly Distributed Systems) January 1, 2013 - December 31, 2015 (3 years). Funded by the Spanish Ministerio de Economia y Competitividad

7.3. International Initiatives

7.3.1. Inria International Partners

7.3.1.1. Informal International Partners

- Department of Computer and Information Science, University of Pennsylvania. There has been several collaborations in the past. Presently M. Gaboardi is a long-term visiting researcher in the programming language group, working on resource control and programming languages.

7.4. International Research Visitors

7.4.1. Visits of International Scientists

Among the visits below, we note the sabbatical year of Xian Xu, from East China University of Science and Technology, Shanghai (paid a scholarship from the Chinese Science Foundation).

- Xian Xu has completed in May a year sabbatical in Focus. He is lecturer at the East China University of Science and Technology in Shanghai.
- Marco Bernardo, Universita' Urbino. A couple of 2 or 3 day visits during the year. Topic: probabilistic process models.
- Simon Gay, University Glasgow. A 1-month visit, March-April. Topic: session types.
- Andrei Dorman, Paris 13. One 3-day visit in May. Topic: Concurrent Interaction Nets and Graph Rewriting
- Patrick Baillot, ENS Lyon, and Gilles Barthe, IMDEA Madrid. One joint 4-day visit in May. Topic: Security and Cryptography
- Matthew Hennessy, University College Dublin. One 3-day visit in June. Topic: probabilistic bisimulations.
- Ramyaa Ramyaa, LMU Munich. One 1-week visit in June.
- Lionel Vaux and Emmanuel Beffara, Marseille. One 3-day visit in October. Topic: Linear Logic.
- Ludovic Henrio, Inria Sophia Antipolis. One 2-day visit in December. Topic: deadlock-analysis and asynchronous object-oriented languages.
- Stefano Zacchiroli, from Paris 7, has visited us various times for a few days during the year.

7.4.2. Visits to International Teams

We only report visits that were longer than 1 month.

- Roberto Amadini: 6 months at the Optimisation Research Group of NICTA in Melbourne (http://optimisation.nicta.com.au/).
- Ornela Dardha: 1 year (1 November 2012 - 1 November 2013) at IT University of Copenhagen, Denmark, visiting Prof. Marco Carbone (topic: type systems for processes)
- Giulio Pellitta: 6 months at Laboratoire d'Informatique, Université Paris Nord (November 2012 - May 2013). Topic: abstract machines for resouce control in the λ-calculus.
- Tudor Alexandru Lascu: 3 months at Paris 7 (PPS team). Topic: cloud computing.

GALAAD Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. GEOLMI

GEOLMI - Geometry and Algebra of Linear Matrix Inequalities with Systems Control Applications - is an ANR project working on topics related to the Geometry of determinantal varieties, positive polynomials, computational algebraic geometry, semidefinite programming and systems control applications.

The partners are LAAS-CNRS, Univ. de Toulouse (coordinator), LJK-CNRS, Univ. Joseph Fourier de Grenoble; Inria Sophia Antipolis Méditerranée; LIP6-CNRS Univ. Pierre et Marie Curie; Univ. de Pau et des Pays de l'Adour; IRMAR-CNRS, Univ. de Rennes.

More information available at http://homepages.laas.fr/henrion/geolmi.

8.1.2. ANEMOS

ANEMOS - Advanced Numeric for ELMs (Edge Localized Mode) : Modeling and Optimized Schemes - is an ANR project devoted to the numerical modelling study of such ELM control methods as Resonant Magnetic Perturbations (RMPs) and pellet ELM pacing both foreseen in ITER. The goals of the project are to improve understanding of the related physics and propose possible new strategies to improve effectiveness of ELM control techniques. The study of spline spaces for isogemetric finite element methods is proposed in this context.

The partners are IRFM, CEA, Cadarache; JAD, University of Nice - Sophia Antipolis; Inria, Bacchus; Maison de la Simulation CEA-CNRS-Inria-University of Orsay- University of Versailles St Quentin .

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. TERRIFIC

Title: Towards Enhanced Integration of Design and Production in the Factory of the Future through Isogeometric Technologies

Type: COOPERATION (ICT)

Defi: PPP FoF: Digital factories: Manufactoring design and product lifecycle manage

Instrument: Specific Targeted Research Project (STREP)

Duration: September 2011 - August 2014

Coordinator: SINTEF, Oslo (Norway)

Others partners:

Alenia Aeronautica (Italy); Inria Méditerranée (France); Jozef Kepler universitet, Linz (Austria); JOTNE, Oslo (Norway); MAGNA, Steyr (Austria); Missler Software (France); Siemens AG (Germany); Technische Universität Kaiserslautern (Germany); University of Pavia (Italy).

See also: http://terrific-project.eu

Abstract: The project aims at significant improvement of the interoperability of computational tools for the design, analysis and optimization of functional products. An isogeometric approach is applied for selected manufacturing application areas (cars, trains, aircrafts) and for computer-aided machining. Computer Aided Design (CAD) and numerical simulation algorithms are vital technologies in modern product development, yet they are today far from being seamlessly integrated. Their interoperability is severely disturbed by inconsistencies in the mathematical approaches used. Efficient feedback from analysis to CAD and iterative refinement of the analysis model is a feature of isogeometric analysis, and would be an essential improvement for computer-based design optimization and virtual product development. Our vision is to provide and disseminate tangible evidence of the performance of the isogeometric approach in comparison to traditional ones in four important application areas as well as addressing interoperability and other issues that necessarily arise in a large-scale industrial introduction of isogeometry.

8.2.2. Collaborations in European Programs, except FP7

8.2.2.1. PHC TOURNESOL FL

Program: TOURNESOL

Project acronym: PHC TOURNESOL FL 2012 - 26409SH

Project title: Extracting multidimensional shapes

Duration: January 2012 - December 2013

Coordinator: E. Hubert (Inria), A. Cuyt (Universiteit Antwerpen)

Other partners: Inria Sophia-Antipolis (France); Universiteit Antwerpen (Belgium)

Abstract: We are working on the shape-from-moments problem : from measurement-like data, reconstructing a desired object. For many years, this problem has been solved and optimized in the 2D-case thanks to use of complex numbers. Thanks to a new formula, we want to stay in the real domain in order to generalize this problem to multidimensional shapes - in particular 3D-shapes. For more details about our project TOURNESOL: http://www-sop.inria.fr/teams/galaad/joomla/index.php/international-collaborations-147/173-tournesol.html. For more details about the program TOURNESOL: http://www.campusfrance.org/fr/tournesol-communaute-francaise.

8.3. International Initiatives

8.3.1. Participation In International Programs

We have a bilateral collaboration between Galaad and the University of Athens-DIT team ERGA, headed by Ioannis Emiris for the period August 2013-August 2014. It is supported by both Inria and the University of Athens.

Title: Algebraic algorithms in optimization

Abstract: In the past decade, algebraic approaches to optimization problems defined in terms of multivariate polynomials have been intensively explored and studied in several directions. One example is the work on semidefinite optimization and, more recently, convex algebraic geometry. This project aims to focus on algebraic approaches for optimization applications in the wide sense. We concentrate on specific tools, namely root counting techniques, the resultant, the discriminant and non-negative polynomials, on which the two teams have extensive collaboration and expertise. We examine applications in convex algebraic geometry as well as to a newer topic for the two teams, namely game theory. A common thread to these approaches is to exploit any (sparse) structure.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

Wen-Shin Lee and Annie Cuyt (University of Antwerp, Belgium) visited from Monday June 3rd to Friday June 7th in the context of the TOURNESOL project.

8.4.2. Visits to International Teams

Evelyne Hubert was invited to La Trobe university for the whole month of January to carry on a collaboration with Peter van der Kamp on geometric curve flows and their integrability.

Evelyne Hubert and Bernard Mourrain were invited to the Institute of Mathematical Science at the National University of Singapore to participate to the 2 month long program *Inverse Moment Problems: the Crossroads of Analysis, Algebra, Discrete Geometry and Combinatorics*.

Evelyne Hubert and Bernard Mourrain visited Wen-Shin Lee and Annie Cuyt (University of Antwerp, Belgium) on November 20-21 in the context of the TOURNESOL project.

GEOMETRICA Project-Team

8. Partnerships and Cooperations

8.1. Technological Development Actions

8.1.1. ADT PH

Participants: Jean-Daniel Boissonnat, Frédéric Chazal, David Cohen-Steiner, Sonali Digambar Patil, Marc Glisse, Steve Oudot, Clément Maria, Mariette Yvinec.

- Title: Persistent Homology

- Coordinator: Mariette Yvinec (GEOMETRICA)

- Duration: 1 year renewable once, starting date December 2012.
- Others Partners: Inria team ABS, Gipsa Lab (UMR 5216, Grenoble, http://www.gipsa-lab.inpg.fr/)

- Abstract: Geometric Inference is a rapidly emerging field that aims to analyse the structural, geometric and topological, properties of point cloud data in high dimensional spaces. The goal of the ADT PH is to make available, a robust and comprehensive set of algorithmic tools resulting from recent advances in Geometric Inference. The software will include:

tools to extract from the data sets, families of simplicial complexes,

data structures to handle those simplicial complexes,

algorithmic modules to compute the persistent homology of those complexes,

applications to clustering, segmentation and analysis of scalar fields such as the energy landscape of macromolecular systems.

8.1.2. ADT OrbiCGAL

Participants: Mikhail Bogdanov, Aymeric Pellé, Monique Teillaud.

- Title: OrbiCGAL

- Coordinator: Monique Teillaud (GEOMETRICA)

- Duration: 1 year renewable once, starting date September 2013.
- Abstract: OrbiCGAL is a software project supported by Inria as a Technological Development Action (ADT). It is motivated by applications ranging from infinitely small (nano-structures) to infinitely large (astronomy), through material engineering, physics of condensed matter, solid chemistry, etc

The project consists in developing or improving software packages to compute triangulations and meshes in several types of non-Euclidean spaces: sphere, 3D closed flat manifolds, hyperbolic plane.

8.2. Regional Initiatives

8.2.1. Digiteo project TOPERA

Participants: Frédéric Chazal, Marc Glisse, Anaïs Vergne.

TOPERA is a project that aims at developing methods from Topological Data Analysis to study covering properties and quality of cellular networks. It also involves L. Decreusefond and P. Martins from Telecom Paris.

- Starting date: December 2013

- Duration: 18 months

8.3. National Initiatives

8.3.1. ANR Présage

Participants: Olivier Devillers, Marc Glisse, Ross Hemsley, Monique Teillaud, Rémy Thomasse.

- Acronym: Presage.

- Type: ANR blanc.

- Title: *méthodes PRobabilistes pour l'Éfficacité des Structures et Algorithmes GÉométriques*.

- Coordinator: Xavier Goaoc.

- Duration: 31 december 2011 - 31 december 2015.

- Other partners: Inria VEGAS team, University of Rouen.

- Abstract: This project brings together computational and probabilistic geometers to tackle new probabilistic geometry problems arising from the design and analysis of geometric algorithms and data structures. We focus on properties of discrete structures induced by or underlying random continuous geometric objects. This raises questions such as:

- What does a random geometric structure (convex hulls, tessellations, visibility regions...) look like?
- How to analyze and optimize the behavior of classical geometric algorithms on *usual* inputs?
- How can we generate randomly *interesting* discrete geometric structures?

- Year publications: [16], [31], [51].

8.3.2. ANR GIGA

Participants: Jean-Daniel Boissonnat, Frédéric Chazal, David Cohen-Steiner, Mariette Yvinec, Steve Oudot, Marc Glisse.

- Acronym : GIGA.

- Title : Geometric Inference and Geometric Approximation.

- Type: ANR blanc

- Coordinator: Frédéric Chazal (GEOMETRICA)

- Duration: 4 years starting October 2009.
- Others Partners: Inria team-project Titane, Inria team-project ABS, CNRS (Grenoble), Dassault Systèmes.

- Abstract: GIGA stands for Geometric Inference and Geometric Approximation. GIGA aims at designing mathematical models and algorithms for analyzing, representing and manipulating discretized versions of continuous shapes without losing their topological and geometric properties. By shapes, we mean sub-manifolds or compact subsets of, possibly high dimensional, Riemannian manifolds. This research project is divided into tasks which have Geometric Inference and Geometric Approximation as a common thread. Shapes can be represented in three ways: a physical representation (known only through measurements), a mathematical representation (abstract and continuous), and a computerized representation (inherently discrete). The GIGA project aims at studying the transitions from one type to the other, as well as the associated discrete data structures.

Some tasks are motivated by problems coming from data analysis, which can be found when studying data sets in high dimensional spaces. They are dedicated to the development of mathematically well-founded models and tools for the robust estimation of topological and geometric properties of data sets sampled around an unknown compact set in Euclidean spaces or around Riemannian manifolds.

Some tasks are motivated by problems coming from data generation, which can be found when studying data sets in lower dimensional spaces (Euclidean spaces of dimension 2 or 3). The proposed research activities aim at leveraging some concepts from computational geometry and harmonic forms to provide novel algorithms for generating discrete data structures either from mathematical representations (possibly deriving from an inference process) or from raw, unprocessed discrete data. We target both isotropic and anisotropic meshes, and simplicial as well as quadrangle and hexahedron meshes.

- See also: http://www-sop.inria.fr/geometrica/collaborations/giga/

8.3.3. ANR TOPDATA

Participants: Jean-Daniel Boissonnat, Frédéric Chazal, David Cohen-Steiner, Mariette Yvinec, Steve Oudot, Marc Glisse.

- Acronym : TopData.

- Title : Topological Data Analysis: Statistical Methods and Inference.

- Type : ANR blanc

- Coordinator : Frédéric Chazal (GEOMETRICA)

- Duration : 4 years starting October 2013.
- Others Partners: Département de Mathématiques (Université Paris Sud), Institut de Mathḿatiques (Université de Bourgoogne), LPMA (Université Paris Diderot), LSTA (Université Pierre et Marie Curie)

- Abstract: TopData aims at designing new mathematical frameworks, models and algorithmic tools to infer and analyze the topological and geometric structure of data in different statistical settings. Its goal is to set up the mathematical and algorithmic foundations of Statistical Topological and Geometric Data Analysis and to provide robust and efficient tools to explore, infer and exploit the underlying geometric structure of various data.

Our conviction, at the root of this project, is that there is a real need to combine statistical and topological/geometric approaches in a common framework, in order to face the challenges raised by the inference and the study of topological and geometric properties of the wide variety of larger and larger available data. We are also convinced that these challenges need to be addressed both from the mathematical side and the algorithmic and application sides. Our project brings together in a unique way experts in Statistics, Geometric Inference and Computational Topology and Geometry. Our common objective is to design new theoretical frameworks and algorithmic tools and thus to contribute to the emergence of a new field at the crossroads of these domains. Beyond the purely scientific aspects we hope this project will help to give birth to an active interdisciplinary community. With these goals in mind we intend to promote, disseminate and make our tools available and useful for a broad audience, including people from other fields.

8.4. European Initiatives

8.4.1. FP7 Projects

8.4.1.1. CG-Learning

Type: COOPERATION

Defi: FET Open

Instrument: Specific Targeted Research Project

Objectif: FET-Open: Challenging Current Thinking

Duration: November 2010 - October 2013

Coordinator: Friedrich-Schiller-Universität Jena (Germany)

Others partners: National and Kapodistrian University of Athens (Greece), Technische Universität Dortmund (Germany), Tel Aviv University (Israel), Eidgenössische Technische Hochschule Zürich (Switzerland), Rijksuniversiteit Groningen (Netherlands), Freie Universität Berlin (Germany)

Inria contact: Mariette Yvinec

See also: http://cgl.uni-jena.de/

Abstract: The Computational Geometric Learning project aims at extending the success story of geometric algorithms with guarantees to high-dimensions. This is not a straightforward task. For many problems, no efficient algorithm exist that compute the exact solution in high dimensions. This behavior is commonly called the curse of dimensionality. We try to address the curse of dimensionality by focusing on inherent structure in the data like sparsity or low intrinsic dimension, and by resorting to fast approximation algorithms.

8.5. International Initiatives

8.5.1. Inria Associate Teams

8.5.1.1. COMET

Title: Computational methods for the analysis of high-dimensional data

Inria principal investigator: Steve Y. Oudot

International Partner (Institution - Laboratory - Researcher):

Stanford University (United States) - Computer Science - Leonidas Guibas

Ohio State University (United States) - Computer Science and Engineering - Yusu Wang

Duration: 2011 - 2013

See also: http://geometrica.saclay.inria.fr/collaborations/CoMeT/index.html

CoMeT is an associate team between the Geometrica group at Inria, the Geometric Computing group at Stanford University, and the Computational Geometry group at the Ohio State University. Its focus is on the design of computational methods for the analysis of high-dimensional data, using tools from metric geometry and algebraic topology. Our goal is to extract enough structure from the data, so we can get a higher-level informative understanding of these data and of the spaces they originate from. The main challenge is to be able to go beyond mere dimensionality reduction and topology inference, without the need for a costly explicit reconstruction. To validate our approach, we intend to set our methods against real-life data sets coming from a variety of applications, including (but not restricted to) clustering, image or shape segmentation, sensor field monitoring, shape classification and matching. The three research groups involved in this project have been active contributors in the field of Computational Topology in the recent years, and some of their members have had long-standing collaborations. We believe this associate team can help create new synergies between these groups.

8.6. International Research Visitors

Mirel Ben Chen (Technion - Israel Institute of Technology)

Benjamin Burton (University of Queensland)

Pedro Machado Manhães de Castro (Universidade Federal de Pernambuco)

Arijit Ghosh (Indian Statistical Institute)

Michael Hemmer (University of Technology Braunschweig)

Dmitriy Morozov (Berkeley)

Yusu Wang (Ohio State University)

Jian Sun (Tsinghua University - China)

Yuan Yao (Peiking University - China)

GRAPHIK Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR

8.1.1.1. ASPIQ

Participants: Jean-François Baget, Jérôme Fortin, Marie-Laure Mugnier, Michel Leclère.

ASPIQ (ASP technologIes for Querying large scale multisource heterogeneous web information), is an ANR white program (duration: 4 years) that started in Oct. 2012. The project coordinator is Odile Papini (LSIS). It involves partners from CRIL and LERIA.

The main objective of this project is to propose:

- extensions of standard ASP for representing OWL2 tractable sublanguages;
- new operations for merging conflicting information in this extended ASP;
- the identification of subclasses of this extended ASP allowing for efficient query answering mechanisms;
- an implementation of a prototype reasoning system.
- *See Section 6.1 for this year results (Extensions of the Framework).*

8.1.1.2. Pagoda

Participants: Jean-François Baget, Marie-Laure Mugnier, Mélanie König, Michaël Thomazo.

Pagoda (Practical Algorithms for Ontology-based Data Access)is an ANR JCJC (young researchers) project that started in Jan. 2013 (duration: 4 years). The project coordinator is Meghyn Bienvenu (LRI). It involves partners from the EPI LEO, the LIG, and the Anatomy Laboratory of Grenoble.

The primary aim of this project is to help address challenges brought by scalability and the handling of data inconsistencies by developing novel OBDA (Ontology Based Data Access) query answering algorithms and practical methods for handling inconsistent data.

- *See Section 6.1 for this year results.*

8.1.1.3. Qualinca

Participants: Michel Leclère, Michel Chein, Madalina Croitoru, Léa Guizol, Rallou Thomopoulos, Marie-Laure Mugnier, Alain Gutierrez.

Qualinca is an ANR Contint project that started in Apr. 2012 (duration: 4 years). The project coordinator is Michel Leclère (GraphIK). It involves partners from LRI, LIG, ABES and INA.

The main objective is to elaborate mechanisms allowing to:

- evaluate the quality of an existing document base;
- maintain a given level of quality by controlling updating operations;
- increase the quality of a given base;
- develop generic methods that take into account the quality of a given base (for instance for searching documents or interconnecting bases).
- *See Section 6.3 for this year results.*

8.1.2. Competitivity Clusters

We are taking part in the Laboratory of Excellence ("labex") *NUMEV* (Digital and Hardware Solutions, Modelling for the Environment and Life Sciences), led by University of Montpellier 2 in partnership with CNRS, University of Montpellier 1 and Inria. This project aims at developping information and communication technologies for environmental and life sciences. We are participating to one of the four axis, namely "Scientific Data: processing, integration and security".

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. EcoBioCap

Participants: Patrice Buche, Madalina Croitoru, Jérôme Fortin, Patricio Mosse.

Ecobiocap is a FP7-KBEE project that started in March 2011 (duration: 4 years). It is led by INRA (and scientifically managed by Montpellier IATE aboratory). It involves sixteen partners among which Cork University (Ireland), CSIC (Spain), Roma University La Sapienza (Italy), SIK (Sweden). The objective of EcoBioCAP is to "provide the EU food industry with customizable, ecoefficient, biodegradable packaging solutions with direct benefits both for the environment and EU consumers in terms of food quality and safety". GraphIK is involved in this project via its common members with IATE team. The budget is managed by IATE team.

- *See Section 6.2 for this year results.*

8.2.2. Collaborations with Major European Organizations

Richard Booth: University of Luxembourg, Interdisciplinary Centre for Security, Reliability and Trust (Luxembourg)

Souhila Kaci collaborates with Richard Booth on abstract argumentation. Madalina Croitoru and Michaël Thomazo collaborate with Richard Booth on argumentation labelling distances.

Leon van der Torre: University of Luxembourg, Computer Science and Communications Research Unit (Luxembourg)

Souhila Kaci collaborates with Leon van der Torre on argumentation aspects. They co-supervise a PhD student (Tjitze Rienstra).

Sebastian Rudolph: TU Dresden (Germany)

Jean-François Baget, Marie-Laure Mugnier and Michaël Thomazo collaborate with Sebastian Rudolph on existential rules. Michaël Thomazo started a postdoc in Sebastian Rudolph's team. Madalina Croitoru collaborates with Sebastian Rudolph (also with Sarah Gaggl) on approximation algorithms for argumentation semantics, as well as on multi agent knowledge allocation.

Srdjan Vesic: University of Luxmbourg, Individual and Collective Reasoning research group (Luxembourg)

Madalina Croitoru collaborates with Srdjan Vesic on logical argumentation in the positive existential fragment of first-order logic with and without preferences.

Nir Oren: University of Aberdeen, Department of Computing Science (United Kingdom)

Madalina Croitoru collaborates with Nir Oren on graphical norm representation and reasoning, as well as on arguing about preferences using a structured argumentation framework.

Ioannis A. Vetsikas: University of Athens, IIT (Greece)

Madalina Croitoru collaborates with Ioannis A. Vetsikas on information selling mechanism design.

Talal Rahwan: University of Southampton, School of Electronics and Computer Science (United Kingdom)

Tomasz Michalak: University of Oxford, Department of Computer Science (United Kingdom)

Madalina Croitoru collaborates with Talal Rahwan and Tomasz Michalak on coalition formation using graphs structures.

8.3. International Research Visitors

8.3.1. Visits of International Scientists

- March 2013: Richard Booth (Univ. of Luxembourg). LIRMM AI seminar on *Quantifying disagreement in argument-based reasoning*.
- March 2013: Wojtek Jamroga (Univ. of Luxembourg). LIRMM AI seminar on *Some Funny Complexity Results for Judgment Aggregation*.
- April 2013: Pierre Bourhis (Univ. of Oxford). GraphIK seminar on *The Impact of Disjunction on Query Answering Under Guarded-based Existential Rules*.
- May 2013: Georg Gottlob (Univ. of Oxford). GraphIK seminar on *The Hypergraph Transversal Problem: Applications, Complexity, and Tractable Cases*.
- October 2013: Carsten Lutz (Univ. of Bremen). GraphIK seminar on *Ontology-Based Data Access: A Study Through Disjunctive Datalog, CSP, and MMSNP*, in the context of Michaël Thomazo's PhD's defense.
- October 2013: Georg Gottlob (Univ. of Oxford). GraphIK seminar on *Robust Constraint Satisfaction and Local Hidden Variables in Quantum Mechanics*, in the context of Michaël Thomazo's PhD's defense.
- November 2013: Roman Kontchakov and Michael Zakharyaschev (Birkbeck College, Londres). GraphIK seminar on *Theory and practice of ontology-based data access with OWL 2 QL.*

8.3.2. Visits to International Teams

Patrice Buche visited Wageningen UR Food and Biobased Research (Nederlands) two days in May 2013 (scientific exchanges on quantity and units ontologies).

INDES Project-Team

7. Partnerships and Cooperations

7.1. National initiatives

7.1.1. ANR DEFIS PWD

The PWD project (for "Programmation du Web diffus") has been funded by the ANR Défis programme for 4 years, starting November 2009. The partners of this project are the teams INDES (coordinator), LIP6 at University Pierre et Marie Curie and PPS at University Denis Diderot.

7.1.2. FUI X-Data

Broadly available big and open data open new perspectives in terms of use and applications. The X-Data project aims at validating this claim by using actual data sets for building realistic applications. The goal is to combine a large variety of data sets coming from different partners (Data Publica, Orange, EDF, La Poste, social networks, ...) to build innovative applications. The Indes team designs and implements new programming language constructs that help programming these applications.

7.1.3. MEALS

The MEALS project (Mobility between Europe and Argentina applying Logics to Systems), IRSES program, started October 1st (2011), and will end September 30th, 2015. The project goals cover three aspects of formal methods: specification (of both requirement properties and system behavior), verification, and synthesis. The Indes members are involved in the task of Security and Information Flow Properties (WP3). The partners in this task include University of Buenos Aires, University of Cordoba, Inria (together with Catuscia Palamidessi, Kostas Chatzikokolakis, Miguel Andrés) and University of Twente.

7.2. European initiatives

7.2.1. FP7 Projects

Program: RAPP

Title: Robot App Store

Collaborator: Inria Coprin

Abstract: RAPP is a 36 months pan-european FP7 project, started in December 2013. Hop is used in the development of prototypes of the Coprin Ang rollator transfer device, for mobility assistance and activity monitoring.

7.2.2. Collaborations in European Programs, except FP7

Program: ICT Cost Action IC1201

Program acronym: BETTY

Project title: Behavioural Types for Reliable Large-Scale Software Systems

Duration: October 2012 - October 2016

Coordinator: Simon Gay, University of Glasgow

Other partners: Several research groups, belonging to 22 european countries

Abstract: The aim of BETTY is to investigate and promote behavioural type theory as the basis for new foundations, programming languages, and software development methods for communication-intensive distributed systems. Behavioural type theory encompasses concepts such as interfaces, communication protocols, contracts, and choreography.

LAGADIC Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. i-Lab ExtAR

Participants: Clément Samson, Eric Marchand.

duration: 24 months.

ExtAR is an Inria i-Lab with Artefacto that started in March 2011. Its goal was to develop an augmented reality library for smartphones.

8.1.2. Oseo Apash project

Participants: François Pasteau, Marie Babel.

no Insa Rennes 2012-230, duration: 24 months.

Started in September 2012, the Apash project is supported by the Images & Réseaux cluster. It involves three laboratories connected to INSA Rennes, namely Irisa/Inria, IETR and LGCGM. Two industrial partners take part into this project: AdvanSEE and Ergovie. It aims at designing a driving assistance for electrical wheelchair towards the autonomy and security of disabled people. The work realized within this project is described in Section 6.3.4 .

8.1.3. ARED NavRob

Participants: Suman Bista, Paolo Robuffo Giordano, François Chaumette.

no Inria Rennes 8033, duration: 36 months.

This project funded by the Brittany council started in October 2013. It supports in part Suman Bista's Ph.D. about visual navigation of a humanoid robot (see Section 8.2.4).

8.2. National Initiatives

8.2.1. ANR P2N Nanorobust

Participants: Le Cui, Eric Marchand.

no. UR1 11FA310-06D, duration: 48 months.

This project started in November 2011. It is composed of a consortium managed by Femto-ST in Besançon with LPN and Isir in Paris, Thalès and Lagadic group through the "Université de Rennes 1". Nanorobust deals with the development of micro- and nano-manipulation within SEM (Scanning Electron Microscope). Our goal is to provide visual servoing techniques for positioning and manipulation tasks with a nanometer precision.

8.2.2. ANR Contint Visioland

Participants: Patrick Rives, François Chaumette.

duration: 48 months.

This project started in November 2013. It is composed of a consortium managed by Onera in Toulouse with Airbus, Spikenet Technology, Irccyn, and Lagadic. It aims is to develop vision-based localization and navigation techniques for an autonomous landing on a runway.

8.2.3. PEA Decsa

Participants: Aurélien Yol, Eric Marchand.

no Inria Rennes 6630, duration: 36 months.

This project started in November 2011. It is composed of a consortium managed by Astrium with the Novadem, Sirehna, Spot Image and Magellium companies, and with the Inria Lagadic and Steep groups. It is devoted to the development of navigation and perception algorithms for small drones in urban environment.

8.2.4. Oseo Romeo 2

Participants: Nicolas Cazy, Suman Bista, Fabien Spindler, Paolo Robuffo Giordano, François Chaumette.

no Inria Rennes 7114, duration: 48 months.

This project started in November 2012. It is composed of a large consortium managed by Aldebaran Robotics. It aims to develop advanced control and perception functionalities to a humanoid robot. It supports in part Suman Bista's Ph.D. about visual navigation of a humanoid robot (see Section 8.2.4), as well as Nicolas Cazy's Ph.D. about model-based predictive control for visual servoing.

8.2.5. Equipex Robotex

Participants: Fabien Spindler, François Chaumette.

no Inria Rennes 6388, duration: 10 years.

Lagadic is one of the 15 French partners involved in the Equipex Robotex network. It is devoted to get significative equipments in the main robotics labs in France. In a near future, we plan to buy a humanoid robot, Romeo, by Aldebaran Robotics.

8.2.6. Inria large scale initiative action PAL

Participants: François Pasteau, Vishnu Narayanan, Cyril Joly, Marie Babel, Patrick Rives, François Chaumette.

Lagadic participates in the large-scale initiative action PAL (Personally Assisted Living) to develop technologies and services to improve the autonomy and quality of life for elderly and fragile persons. The purpose of PAL is to provide an experimental infrastructure, in order to facilitate the development of models, tools, technologies and concept demonstrations. Using the skills and objectives of the involved teams, four research themes have been defined: a) assessing the degree of frailty of the elderly, b) mobility of people, c) rehabilitation, transfer and assistance in walking, and d) social interaction. Lagadic is currently involved in the themes "mobility of people" and "assistance in walking" through collaborations with the EPI e-Motion (Grenoble), EPI Coprin (Sophia-Antipolis), and Handibio (Toulon). See Sections 6.2.3 , 6.3.4 , 6.3.5 and 6.4.4 .

Furthermore, the annual three-day PAL workshop has been organized in Rennes by François Pasteau, Marie Babel and Céline Gharsalli in July 2013.

8.3. European Initiatives

8.3.1. FP7 Projects

8.3.1.1. FP7 Space RemoveDEBRIS

Participants: Eric Marchand, Fabien Spindler, François Chaumette.

Instrument: Specific Targeted Research Project
Duration: from October 2013 till September 2016
Coordinator: University of Surrey (United Kingdom)
Partner: Surrey Satellite Technology (United Kingdom), Astrium (Toulouse, France and Bremen, Germany), Isis (Delft, The Netherlands), CSEM (Neuchâtel, Switzerland), Stellenbosch University (South Africa).
Inria contact: François Chaumette
Abstract: The goal of this project is to validate the model-based tracking algorithms developped during Antoine Petit's Ph.D. (see Section 6.1.1) on images acquired during an actual space debris removal mission.

8.3.1.2. FP7 Regpot Across

Participant: François Chaumette.

Program: Regpot

Project acronym: Across

Project title: Center of Research Excellence for Advanced Cooperative Systems

Duration: from September 2011 till March 2015

Coordinator: Prof. Ivan Petrovic from University of Zagreb (Croatia)

Other partners: KTH (Sweden), ETHZ (Switzerland), TUM (Germany), University of Manchester (UK), Vienna University of Technology (Austria), Politecnico di Milano (Italy), University of Sevilla (Spain), Eindhoven University of Technology (The Netherlands), University of Athens (Greece), etc.

Abstract: the goal of this project is to enhance collaborations with the University of Zagreb.

8.4. International Initiatives

8.4.1. Participation In other International Programs

- As a follow up to the long term collaboration with the "Centro de Tecnologia da Informação Renato Archer" (CTI) in Campinas (Brazil), a new Ph.D. student, Renato José Martins, joint the team in Sophia Antipolis thanks to a grant from the CNPq (2013-2017). He is co-directed by Patrick Rives and Samuel Siqueira Bueno from "Divisão de Robótica e Visão Computacional" at CTI. In the context of the project MuNave, funded by the Inria/CNPq Collaboration framework (2010-2012), Geraldo Silveira, researcher at CTI, has spent a one-week visit in Sophia Antipolis in May 2013.
- Alexandre Krupa started a collaboration with Nassir Navab from the Technische Universität München by beginning since September 2013 the joint supervision of Pierre Chatelain's Ph.D.

8.5. International Research Visitors

8.5.1. Visits of International Scientists

8.5.1.1. Internships

- Raul Orlando Alvarado Lara and Francisco-Javier Rangel Butanda from the University of Guanajuato in Mexico did a 4-month master internship in Rennes. It was granted by Conacyt and their work was about visual servoing and 3D localization respectively.
- Ivan Markovic, Ph.D. student at the University of Zagreb, spent a three-month visit in Rennes in the scope of the FP7 Regpot Across project (see Section 8.3.1.2 and 6.3.6).
- Eduardo Moral-Fernandez, Ph.D. student at the Universidad de Malaga, Spain, visited our group in Sophia Antipolis from March to December 2013. He worked on dense SLAM using omnidirectional RGB-D sensors.

8.5.2. Visits to International Teams

- Manikandan Bakthavatchalam spent a three-month visit at ISR in Coimbra, Portugal, for collaborating with Omar Tahri about visual servoing based on photometric moments (see Section 6.2.1).
- Rafiq Sekkal spent a two-month visit at UPC in Barcelona, Spain, to collaborate with Ferran Marques on contour-based spatio-temporal segmentation (see Section 6.1.6).
- Pierre Chatelain spent a four-month visit in Nassir Navab'slab at TUM, Germany, in the scope of his Ph.D.

LOGNET Team

8. Partnerships and Cooperations

8.1. European Initiatives

8.1.1. Collaborations in European Programs, except FP7

Program: INTERREG ALCOTRA

Project acronym: myMed

Project title: " a peer-to-peer programmable social network and cloud platform"

Duration: January 2010-march2014

Coordinator: Luigi Liquori

Other partners: University of Turin, Politech of Turin, Univ. of Piemonte Orientale

Founded 1.3Meur on 3 year (2010-2013)

Abstract: see above

8.2. International Initiatives

8.2.1. Inria International Partners

- University of Udine, Italy, collaborations, common papers and projects and visits since 1990.
- Politecnico di Torino, Italy, collaborations, common papers and visits since 2000.
- Politecnica de Valencia, Spain, collaborations and projects and teaching and visits since 2004.
- University of Novi Sad, Serbia, collaboration, common projects and papers and visits since 2004.

8.3. International Research Visitors

8.3.1. Visits of International Scientists

- Demis Ballis, Assistant Professor, Politecnica Valencia, one week,
- Marina Ribaudo, Associate professor, Università di Genova, 2 days,
- Giovanni Chiola, Full Professor, Università di Genova, 2 days,
- Seif Aridi, Full Professor, KTH Stocholm, 3 days,
- Nguyen Huu Thanh, Associate Professor, Hanoi University of Science and Technology, one week.

8.3.1.1. Internships

- Nicolas Gauche, IUT NIce, from Apr 2013 until Jun 2013: "conception et implémentation d'un réseau social appellé myCarPooling";
- Benjamin Lissillour, IUT Nice, from Apr 2013 until Jun 2013: "portage de la base de donnée noSQL Cassandra 0.7 versus la nouvelle release 1.2";
- Romain Guillot, IUT Nice, from Apr 2013 until Jun 2013: "conception et implémentation d'un système de monitoring pour un cloud de PC distribués, appellé ProtectYourself".

MAESTRO Project-Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. ANR Marmote

Participants: Alain Jean-Marie, Issam Rabhi.

ANR Program: Modèles Numériques (MN) 2012

Project title: MARkovian MOdeling Tools and Environments

Duration: January 2013 - December 2016

Coordinator: Alain Jean Marie (Inria)

Partners: Inria (project-teams DYOGEN, MAESTRO and MESCAL), Univ. Versailles-Saint-Quentin (PRiSM lab.), Telecom SudParis (SAMOVAR lab.), Univ. Paris-Est Créteil (LACL), and Univ. Pierre-et-Marie-Curie (LIP6)

Abstract: ANRMARMOTE aims at realizing the prototype of a software environment dedicated to modeling with Markov chains. It brings together seven partner teams, expert in Markovian analysis, who will develop advanced solution algorithms and applications in different scientific domains: reliability, distributed systems, biology, physics and economics.

https://wiki.inria.fr/MARMOTE/Welcome

7.2. European Initiatives

7.2.1. FP7 Projects

7.2.1.1. CONGAS

Participants: Eitan Altman, Konstantin Avrachenkov, Yonathan Portilla, Alexandre Reiffers.

Project title: Dynamics and coevolution in multi level strategic interaction games

Type: COOPERATION

Challenge: Future and Emerging Technologies

Instrument: Specific Targeted Research Project

Objective: FET Proactive: Dynamics of Multi-Level Complex Systems (DyM-CS)

Duration: October 2012 - September 2015

Coordinator: Francesco De Pellegrini (CREATE-NET)

Scientific Coordinator: Eitan Altman (Inria)

Other partners: Center for Research and Telecommunication Experimentation for Network Communities (Italy), Univ. d'Avignon et des Pays de Vaucluse (France), Technische Universiteit Delft (The Netherlands), Imperial College of Science, Technology and Medicine (United Kingdom), Univ. di Pisa (Italy) and Technion - Israel Institute of Techonology (Israel)

Inria contact: Konstantin Avrachenkov

Abstract: CONGAS will develop new mathematical models and tools, rooted in game theory, for the analysis, prediction and control of dynamical processes in complex systems. It will provide a coherent theoretical framework for understanding the emergence of structure and patterns in these systems, accounting for interactions spanning various scales in time and space, and acting at different structural and aggregation levels.

MAESTRO's task is to develop game theoretic models to model (a) the formation of technological and social network; (b) the routing for competing agents; and (c) the competition of information in social networks.

http://www.congas-project.eu/

7.2.2. Collaborations in European Programs, except FP7

Program: PHC Tournesol FL - Belgium

Project title: Stochastic modelling of dissemination and epidemic processes on complex networks

Duration: January 2013 - December 2013

Coordinator: B. Prabhu (LAAS-CNRS) is coordinator for French side and D. Fiems is coordinator for Belgian side

Other partners: CNRS, LAAS (France); Ghent University, TELIN (Belgium)

More info: The role of MAESTRO is to work on information propagation models in online social network with directed links.

7.2.3. Collaborations with Major European Organizations

European Space Operations Centre: European Space Agency, Darmstadt (Germany)

Application of a BitTorrent-like data distribution model to mission operations. In the framework of this project with ESA we cooperate with Thales-Alenia Space (France) and with Teletel S.A. (Greece).

7.3. International Initiatives

7.3.1. Inria Associate Teams

7.3.1.1. GANESH

Participants: Eitan Altman, Konstantin Avrachenkov, Manjesh Kumar Hanawal, Parmod Kumar.

Title: GAmes, OptimizatioN and Analysis of NEtworkS THeory and Applications

Inria principal investigator: Eitan Altman

International Partners (Institution - Laboratory - Researcher):

IISc Bangalore (India) - Electrical Communication Engineering - Anurag Kumar

IIT Bombay (India) - Department of Electrical Engineering - D. Manjunath

IIT Madras (India) - Electrical Engineering - Venkatesh Ramaiyan

Duration: 2012 - 2014

See also: http://www-sop.inria.fr/members/Eitan.Altman/Ganesh/Home.html

This project aims at producing outstanding contributions to the foundations of the theory of networks, in game theory, team theory, optimization and analysis. Three areas in networking will be used to apply these: (a) economy of networks and network neutrality, (b) scheduling in wireless networks, and (c) distributed optimization issues in ad-hoc networks.

7.3.2. Inria International Partners

7.3.2.1. Informal International Partners

MAESTRO has continued collaborations with researchers from GERAD, Univ. Montreal (Canada), Flinders Univ. (Australia), National Univ. of Rosario (Argentina), Technion – Israel Institute of Technology (Israel), Univ. of Arizona (USA), Univ. of Illinois at Urbana-Champaign (USA), Univ. of Liverpool (UK), Univ. of Massachusetts at Amherst (USA), Univ. of Palermo (Italy), and Univ. of Twente (The Netherlands); cf. Sections 7.4.1.1 and 7.4.2 .

7.4. International Research Visitors

7.4.1. Visits of International Scientists

7.4.1.1. Professors / Researchers

Koen De Turck

Subject: Information Dissemination in Directed Online Social Networks

Date: from 25 Nov 2013 until 27 Nov 2013

Institution: Ghent Univ. (Belgium)

Jocelyne Elias

Subject: Network Covering

Date: from 29 Nov 2013 until 28 Dec 2013

Institution: Paris Descartes Univ. (France)

Dieter Fiems

Subject: Information Dissemination in Directed Online Social Networks

Date: from 25 Nov 2013 until 27 Nov 2013

Institution: Ghent Univ. (Belgium)

Vladimir Gaitsgory

Subject: Singular Perturbations in Markov Decision Processes

Date: from 30 Nov 2013 until 6 Dec 2013

Institution: Flinders University (Australia)

Jasper Goseling

Subject: Random Access with Physical-layer Network Coding

Date: from 13 Oct 2013 until 16 Oct 2013

Institution: Univ. of Twente (Netherlands)

Roberto Lucchetti

Subject: Application of Cooperative Games to Networks

Date: from 10 Jul 2013 until 12 Jul 2013

Institution: Politecnico di Milano (Italy)

Natalia Markovich

Subject: Modeling Clusters of Extreme Values in Random Walk Processes

Date: from 1 Jul 2013 until 15 Aug 2013

Institution: Russian Academy of Sciences (Russia)

Fabio Martignon

Subject: Network covering

Date: from 29 Nov 2013 until 28 Dec 2013

Institution: Paris Sud Univ.(France)

Vladimir Mazalov

Subject: Networking Games and Cloud Computing Market

Date: from 17 Sep 2013 until 18 Oct 2013

Institution: Petrozavodsk State Univ. (Russia)

Leon Petrosian

Subject: Game Theoretic Models in Network Formation

Date: from 2 Aug 2013 until 9 Aug 2013

Institution: St. Petersburg State Univ. (Russia)

Bruno Ribeiro

Subject: Online Myopic Network Covering

Date: from 12 Jun 2013 until 19 Jun 2013

Institution: Univ. Massachusetts, Amherst (USA)

Don Towsley

Subject: Randomness and Wireless Security

Date: from 15 Apr 2013 until 19 Apr 2013

Institution: Univ. Massachusetts, Amherst (USA)

Kavitha Voleti Veeraruna

Subject: Performance Analysis of Social Networks Using Game Theoretical Tools

Date: from 28 May 2013 until 7 Jun 2013

Institution: IIT Bombay (india)

Piotr Wiecek

Subject: Evolutionary Game Models

Date: from 16 Sep 2013 until 27 Sep 2013

Institution: Wrocław Univ. of Technology (Poland)

Sulan Wong

Subject: European Approach to Net Neutrality

Date: from 1 Dec 2013 until 15 Jan 2014

Institution: Univ. de A Coruña (Spain)

Uri Yechiali

Subject: A Retrial System with Two Input Streams and Two Orbit Queues

Date: from 21 Apr 2013 until 4 May 2013

Institution: Tel Aviv Univ. (Israel)

7.4.1.2. Ph.D. students

Giovanni Accongiagioco

Subject: Game theoretic models applied to the Internet Economy

Date: from 14 Jan 2013 until 13 Jul 2013

Institution: Pisa Univ. (Italy)

Liudmila Ostroumova

Subject: Epidemic models on directed networks

Date: from 26 May 2013 until 9 Jun 2013

Institution: Yandex and Moscow State Univ. (Russia)

Cristina Rottondi

Subject: Privacy in smart grids

Date: from 1 Nov 2013 until 30 Nov 2013

Institution: Politecnico di Milano (Italy)

Rodrigo Vaca Ramirez

Subject: Vertical handover framework towards energy efficiency

Date: from 23 Nov 2012 until 12 Mar 2013

Institution: Univ. of Edinburgh (UK)

7.4.1.3. Internships

Xinwei Bai

Subject: Optimization of spatial caches

Date: from 15 Sep 2013 until 14 Dec 2013

Institution: Univ. of Twente (Netherlands)

Grégoire Beaudoire

Subject: Complexity Analysis of the Network Coverage Problem

Date: from 10 Jun 2013 until 26 Jul 2013

Institution: ENS Lyon (France)

Kumar Chippala

Subject: Numerical comparison of various multi-armed bandit algorithms

Date: from 2 May 2013 until 23 Jul 2013

Institution: IIT Bombay (India)

Engin Eljez

Subject: Congestion games with cost that decrease in the congestion

Date: from 1 Jun 2013 until 29 Jul 2013

Institution: Politecnico di Torino (Italy)

Simon Forest

Subject: Graphes aléatoires : génération, épidémies, applications

Date: from 10 Jun 2013 until 2 Aug 2013

Institution: ENS Paris (France)

Sushma Hanawal

Subject: Creation, Simulation and Multidiscipline Evaluation of Dynamic Mobility Models in Complex Systems

Date: from 25 Aug 2012 until 25 Mar 2013

Institution: SJCE Mysore (India)

Denys Korostii

Subject: Polls in online social networks

Date: from 1 Mar 2013 until 31 Aug 2013

Institution: Univ. Nice Sophia Antipolis (France)

Vasily Medyanikov

Subject: Graph-theoretic Models for Evolution of Social Networks

Date: from 22 Jul 2013 until 11 Aug 2013

Institution: St. Petersburg State Univ. (Russia (Russian Federation))

Tanmay Vashistha Sharma

Subject: Diffusion Processes in Networks

Date: from 6 May 2013 until 12 Jul 2013

Institution: IIT Bombay (India)

Xiuhui Ye

Subject: Raise of influential individuals in Online Social Networks

Date: from 15 May 2013 until 15 Nov 2013

Institution: Politecnico di Torino (Italy)

7.4.2. Visits to International Teams

MAESTRO members have visited (the)

- GERAD, Univ. Montreal, Canada in the period 20 October – 10 November 2013 (**A. Jean-Marie**);
- Ghent Univ., Belgium in the period 21–22 November 2013 (**K. Avrachenkov**);
- Flinders Univ., Australia in the period 20 March – 20 April 2013 (**K. Avrachenkov**);
- National Univ. of Rosario, Argentina in the period 4 – 15 March 2013 (**A. Jean-Marie**);
- Petrozavodsk State Univ., Russia in the period 26 – 28 June 2013 (**K. Avrachenkov**);
- Technical Univ. of Darmstadt, Germany in the period 5–6 October 2013 (**G. Neglia**);
- Technion – Israel Institute of Technology, Tel Aviv, Israel in the period 19–28 April 2013 (**E. Altman**);
- Univ. of Arizona, USA in the period 31 March – 2 June 2013 (**M. K. Hanawal**);
- Univ. of Illinois at Urbana-Champaign, USA in the period 1 October 2013 – 31 January 2014 (**M. El Chamie**);
- Univ. of Liverpool, UK in the period 6 – 14 February 2013 (**K. Avrachenkov**);
- Univ. of Massachusetts at Amherst, USA in the periods 1 September – 30 October 2013 (**N. Choungmo Fofack**) 1–10 May 2013 and 25–30 October 2013 (**P. Nain**);
- Univ. of Twente, The Netherlands in the period 19 – 20 June 2013 (**K. Avrachenkov**);
- Yandex Research and Institute of Control Problems, Russia in the period 21 – 30 October 2013 (**K. Avrachenkov**);

MARELLE Project-Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. ANR

- We participated in the ANR project TAMADI, which started in October 2010. Other participants are ARENAIRE-Inria Rhone-Alpes and the PEQUAN team from University of Paris VI Pierre and Marie Curie. The objective of the TAMADI project is to study the question of precision in floating-point arithmetic and to provide formal proofs on this topic. This project was completed in October 2013.

7.2. European Initiatives

7.2.1. FP7 Projects

7.2.1.1. FORMATH

Type: COOPERATION

Defi: Future and Emerging Technologies

Instrument: Specific Targeted Research Project

Objectif: FET-Open: Challenging Current Thinking

Duration: March 2010 - August 2013

Coordinator: University of Göteborg (Sweden)

Partners: Radboud University Nijmegen, (the Netherlands), University of La Rioja, (Spain).

Site: http://wiki.portal.chalmers.se/cse/pmwiki.php/ForMath/ForMath

Inria contact: Y. Bertot

Abstract: The objective of this project is to develop libraries of formalised mathematics concerning algebra, linear algebra, real number computation, and algebraic topology. The libraries that we plan to develop in this proposal are especially chosen to have long-term applications in areas where software interacts with the physical world. The main originality of the work is to structure these libraries as a software development, relying on a basis that has already shown its power in the formal proof of the four-colour theorem, and to address topics that were mostly left untouched by previous research in formal proof or formal methods.

7.3. International Initiatives

7.3.1. Informal International Partners

We interact regularly with the team of Prof. Thierry Coquand at University of Göteborg and Chalmers University in Sweden and the team of Prof. Julio Rubio at Universidad de La Rioja in spain.

7.4. International Research Visitors

7.4.1. Visits of International Scientists

Amy Felty, professor at the University of Ottawa, Doug Howe, professor at Carleton University in Canada, are visiting from September 2013 to Summer 2014.

7.4.1.1. Internships

- Florent Bréhard, student at École Normale Supérieure, worked from June to August 2013 on *homotopy type theory*. In particular, he produced a proof of equivalence between various presentations of spheres, at all dimensions.
- Antoine Grospellier, student at École Normale Supérieure, worked from June to August 2013 on integrating automatic proof tools for first order logic in the Coq system.

7.4.2. Visits to International Teams

- Yves Bertot spent three months From January 15th to April 15th, 2013 at Institute for Advanced Study, Princeton, where he was invited to participate to the special year on *Homotopy Type Theory*.

MCTAO Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

The “région” *Provence Alpes Côte d’Azur* (PACA) partially supports Helen Heninger’s PhD . The other part comes from Thales Alenia space, see section 7.1 .

The “région” *Provence Alpes Côte d’Azur* (PACA) partially supports Jérémy Rouot’s PhD.

8.2. National Initiatives

8.2.1. IMB - Université de Bourgogne, Dijon

The team is officially a common team with University of Nice, but also has very strong links with Université de Bourgogne and IMB (Institute of Mathematics in Burgundy). Bernard Bonnard is currently on leave from Université de Bourgogne; Jean-Baptiste Caillau collaborates actively with us; there is also an active common seminar http://math.unice.fr/~rifford/publis/Journee_McTAO/J_McTAO.html .

A formal convention between Inria and Université de Bourgogne is planned for 2014. It will make the IMB control team a part of McTAO.

8.2.2. GCM (ANR project)

This is a four year project ending in 2013, on Geometric Control Methods, Sub-Riemannian Geometry and Applications. It is organized in four “poles” and gathers people from Université du Sud Toulon-Var, Université de Bourgogne (Dijon), École Polytechnique (Paris), Nancy-Université, Université Joseph Fourier (Grenoble 1), Université Paris Sud, ParisTech ENSTA and Université Nice Sophia-Antipolis. Bernard Bonnard, Jean-Baptiste Caillau and Ludovic Rifford (leader of one pole) are members of this project. More details on the site; http://www-fourier.ujf-grenoble.fr/~charlot/GCM.html.

8.2.3. Others

Bernard Bonnard and Ludovic Rifford participate in the GDR MOA, a CNRS network on Mathematics of Optimization and Applications. http://gdrmoa.univ-perp.fr/.

Jean-Baptiste Caillau is in the board of governors of the group SMAI-MODE (http://smai.emath.fr/spip.php?article338).

Jean-Baptiste Caillau is a member of the Centre de Compétences Techniques (CCT) Mécanique orbitale du CNES

Jean-Baptiste Caillau is the corresponding member in Dijon for the Labex AMIES (http://www.agence-maths-entreprises.fr/).

8.3. European Initiatives

8.3.1. FP7 Projects

Jean-Baptiste Caillau is a member of the SADCO network (FP7-PEOPLE-2010-ITN, grant no. 264735-SADCO), cf. http://itn-sadco.inria.fr.

8.3.2. Collaborations with Major European Organizations

Technische Universität München, Department of Chemistry (Germany).

The applications of optimal control to MNR (see sections 4.2) are conducted with the group of Prof. Steffen Glaser in Munich.

8.4. International Initiatives

University of Hawaii, Department of Mathematics (U. S. A.)

There is a long term collaboration on optimal control and control of quantum systems, see mostly section 6.1.1 . Besides, Gautier Picot, a former Phd student from Dijon has a temporary position at the Math Department and collaborates with M. Chyba and G. Patterson (second Phd student from M. Chyba) in relation with the Laboratoire d'Astronomie de Paris, to apply the Hampath code to make rendez-vous with quasi-asteroids entering in the solar system near the L1-Lagrange point, in the continuation of the work developed by G. Picot and B. Daoud. This collaboration is very active and has to be emphasized.

University of Toronto, Department of Mathematics (Canada)

Optimal Transport. Alice Erlinger's PhD is co-supervised by Ludovic Rifford and John Mc Cann from University of Toronto. See section 6.4 .

8.5. International Research Visitors

8.5.1. Visits of International Scientists

Alessio Figalli, from University of Texas at Austin, visited twice, for a total of slightly more than a month.

8.5.2. Visits to International Teams

There is a strong collaboration with the control group in the University of Hawaii around M. Chyba. B. Bonnard visited the group twice in 2012-2013 (a total of 3 months). The purpose of the collaboration is to study the aspects of the contrast problem in Nuclear Magnetic Resonance, see section 6.1.1 .

Ludovic Rifford was invited to the program "Optimal Transport: Geometry and Dynamics" (http://www.msri.org/programs/277) from august to December at MSRI, Berkeley, USA.

Bernard Bonnard was invited ot the Japanese forum "Math-for-Industry" 2013 on *The Impact of Applications on Mathematics*, November 4 to 8, 2013, Fukuoka. See http://fmi2013.imi.kyushu-u.ac.jp/.

MODEMIC Project-Team

7. Partnerships and Cooperations

7.1. Regional Initiatives

7.1.1. Numev

Within the Labex Numev (Solutions Numériques, Matérielles et Modélisation pour L'Environnement et le Vivant [6]), the team is the coordinator since 2012 of a working group on Modeling and numerical probabilities for ecology and biology with the team EPS of I3M (Univ. Montpellier 2) [7].

7.1.2. LBE

An new interlab seminar about the modeling of bioprocesses has been launched in July 2013 under the responsibility of J. Harmand, involving Biocore and Modemic Inria project-teams [8].

7.2. National Initiatives

7.2.1. ANR project "DISCO"

DISCO (Multi-scale modeling bioDIversity Structure COupling in biofilms) is a project funded by the ANR SYSCOMM since the end of 2009, that ended in May 2013. Modemic has been the coordinator and other partners were Irstea LISC (Clermont-Ferrand), Irstea HBAN (Antony), Inra LBE (Narbonne) and CNRS/UMPC LPMTC (Paris VI). The objectives were to develop and study computational and mathematical models of biofilm dynamics, taking into account the biodiversity (distribution of bacteria species) and the spatial structure. The project had a strong multi-disciplinary dimension, gathering specialists of IBM study and reduction techniques, mathematical analysis of ecosystems modeling, multi-scale modeling of complex structures and dynamics, wastewater engineering and biodiversity measurements through DNA fingerprints, and solid waste biodegradation and microscopic biofilm structure imaging. During the project, several kinds of models (individual-based up to deterministic continuous) have be developed and confronted to experimental data at both micro and macroscopic scales. For the closing of the projet, the team has organized a one day meeting in Paris, combining a project restitution and and international workshop [9].

7.2.2. RNSC project "MnMs"

This year, a partial support of the continuation of the ANR DISCO has been been funded for two years by the RNSC (National Network on Complex Systems). The MnMs (Numerical Models for Microbial ecosystems) project [10] aims at studying how to articulate existing models (discrete, continuous, deterministic, stochastic...) in a multi-scale framework with interactions between various scales. The team is the coordinator and the other partners are Irstea LISC (Clermont-Ferrand) and CNRS/UMPC LPMTC (Paris VI).

We organized a joint seminar with the project DyLeRBio of the RNSC (M. Desroches, Sisyphe/Mycenae projet-team) in Montpellier (September 30, October 1-2 2013) [11].

[6] http://www.lirmm.fr/numev
[7] http://www-sop.inria.fr/members/Fabien.Campillo/gt-modelisation/
[8] https://sites.google.com/site/journeesthematiquesdulbe/home
[9] https://sites.google.com/site/anrdisco/
[10] http://www-sop.inria.fr/members/Fabien.Campillo/mnms/
[11] http://www-sop.inria.fr/members/Fabien.Campillo/projects/mnms/

7.2.3. Inra-MEM program project "ENOC"

Since 2012, the team is the coordinator of the ENOC project with the LBE lab (Inra Narbonne) [[12]], funded the by Inra meta-program MEM (metagenomics of microbial ecosystems). This two-years project proposes a multidisciplinary approach shared by microbial ecologists and mathematicians for the reverse modeling of metagenomic data for microbial resource management. The final objective is to develop a generic approach for predicting ecosystem performance from an unknown inoculum.

7.2.4. Inra-CEPIA project "New perspectives for the MSCF"

A new project submitted to the Inra Dept. CEPIA, entitled "New perspectives for the Multi-Stage Continuous Fermentor (MSCF): Study of fermentations with disturbances, and development of a control law", in which the Montpellier Units SPO and Mistea are involved has been accepted in 2013 and will last 2 years. It is the continuation of the work made within the CAFE project (see Section 7.4) about the control of a wine fermentation process. The goal of the project is to study the fermentations with addition nitrogen. From the control point of view, we will study the control of both the sugar concentration and the CO_2 production rate in each of the 4 reactors of a MSCF.

7.2.5. CNRS-PEPS project "ASYDE"

The team participates to the CNRS PEPS "ASYDE" (Analyse de systèmes de digesteurs biologiques) launched in 2013 for two years, with the objective to develop tools for the analysis and reduction of the models (flat systems, Lyapunov functions, delayed equations...) in microbial ecology. The project is coordinated by the L2S (CNRS/Supélec, Gif-sur-Yvette), with Modemic, LBE (Inra Narbonne) and MIA (Inra Jouy) as partners.

7.2.6. Inria Project Lab "Algae in Silico"

Modemic is a partner of the proposal of the Inria Project Lab "Algae in Silico" launched by Biocore Inria project-team.

7.3. European Initiatives

7.3.1. FP7 Projects

Program: Food, Agriculture and Fisheries, and Biotechnology (Theme 2)
Project acronym: CAFE
Project title: Computer-Aided Food processes for control Engineering
Duration: 2009-2013
Coordinator: CESAME, UCL (Louvain-la-Neuve, Belgium)
Other partners: Alctra, BIV SA, C-Tech Innovation, Irstea, Consejo Superior de Investigaciones Cientificas (CSIC), Wageningen Univ. and Research centre, Institut des Sciences et Industries du Vivant et de l'Environnement Agro Paris Tech, Inra, Povltavske Mlekarny AS, Psutec SPRL, Societa di Progettazione Elettronica e Software S.C.R.L. SPES, Telstar Technologies SLU, The Univ. of Manchester, Univ. Degli Studi di Roma Tor Vergata, X-Flow BV.
Abstract: This is a Large collaborative project, whose objective is to provide new paradigms for the smart control of food processes, on the basis of four typical processes in the areas of bio-conversion, separation, preservation and structuring (resp. wine making, micro-filtration of food beverages, freeze-drying of lactic acid bacteria and ice cream crystallization. The novelty of the project lies in the capacity of combining PAT (Process Analytic Technology) and sensing devices with models and simulation. The team works on the control of multi-stage bioreactors (for wine making) and the regulation of ice quality (ice cream crystallization).
Web-site: http://www.cafe-project.org/

The CAFE project ended in March 2013 (see deliverables [66], [67], [68]). An industrial conference has been organized by the consortium in February 2013 at Irstea (Antony, France),. During the conference, which representatives of several industries in food processing attended, a live demonstration of the designed control law has been performed.

[12] https://sites.google.com/site/enocprojetreversemodelling/

7.4. International Initiatives

7.4.1. Inria International Partners

7.4.1.1. Declared Inria International Partners

From 2010 to 2012, the Inria associated-team Dymecos (DYnamical Microbial and Environmental eCOSystems) has associated the team with three main partners in Chile: UMR CNRS CMM (Santiago), Math. Dept. of UTFSM (Valparaiso) and EIB-PUCV (Valparaiso). A continuation of this associated-team has been submitted for 2014. Within the Inria CIRIC Center in Chile, the team has co-supervised in 2013 the postdoctoral stay of M. Sebbah (part-time in Chile, part-time in France).

7.4.1.2. Informal International Partners

The team has a long term collaboration with Prof. D. Dochain from CESAME (Univ. Louvain-la-Neuve).

7.4.2. Inria International Labs

Lirima STIC-Mada [[13]] since 2010 (Madagascar). The purpose of the project was to develop land use dynamical models corresponding to plots located on the edge of the forest corridor linking the two national parks of Ranomafana and Andringitra in Madagascar. We use both Markov and semi-Markov models to infer the land-use dynamics. The main contribution was the co-advising of a PhD student, Angelo Raherinirina who defended his thesis in August 2013. This work is done in collaboration with IRD in Madagascar.

Lirima NuWat (Numerics for water treatment research) [[14]] 2013-... (Tlemcen, Algeria and Gamma Team/UMR Mistea). NuWat focuses on the numerical Modeling and simulation of microbial ecosystems and their application in biotechnology with a focus on solutions considered as promising for countries of the Maghreb, for instance in waste-water treatment systems and its reuse in agriculture under semi-arid climates. NuWat handles the two following related topics: (1) the elaboration of numerical hybrid models for simulation of bacterial ecosystems combining discrete models (for small size populations) and continuous models (for large size populations, substrate and environment); (2) the systematic numerical and software development for biotechnology process control.

CIRIC-Chile. The future of our collaboration with Chile within the BIONATURE line is not entirely in our hands and relies much on CIRIC's policy regarding fundamental research. Anyway we shall try to continue our fruitful collaboration in modeling and optimal control within the CIRIC project, and ficus more on transfer applications.

7.4.3. Participation In other International Programs

7.4.3.1. TREASURE (Treatment and Sustainable Reuse of Effluents in semiarid climates)

Program: Euromediterranean 3+3

Title: Treatment and Sustainable Reuse of Effluents in semiarid climates

Inria principal investigator: Modemic (J. Harmand),

Partners: Centre de Biotechnology de Sfax, Department of environmental engineering (Tunisia), Ecole Nationale des Ingénieurs de Tunis, Dept. de Mathématiques (Tunisia), Institut National de la Recherche Agronomique, Dept. EA, MICA et MIA (France), National Research Center, Water Pollution Control (Egypt), Univ. of Patras, Process Control Laboratory (Greece), Univ. of Tlemcen, Automatic control (Algeria), Univ. of santiago de compostella, Environmental engineering (Spain) Université Cadi Ayyad de Marrakech, Faculté des Sciences de Semlalia, Dépt. de Mathématiques (Morocco), Centre National de Recherche sur l'Eau et l'Energie, Université Française d'Egypte (Egypt)

Duration: Jan 2012 - Dec 2015

[13] http://www.Lirima.uninet.cm/index.php/recherche/equipes-de-recherche/stic-mada
[14] https://project.inria.fr/nuwat/

Abstract: The TREASURE network aims at integrating knowledge on the modeling, the control and the optimization of biological systems for the treatment and reuse of wastewater in countries submitted to semi-arid climates under both socio-economical and agronomic constraints within the actual context of global changes. A special focus of the actual project concerns the integration of technical skills together with socio-economical and agronomic studies for the integrated solutions developed within the network to be evaluated and tested in practice in the partner's countries and, as possible as it may be within the context of the actual research network, valorizing these proposed technologies with the help of industrial on site in partners from South.

Web-site: https://project.inria.fr/treasure

7.4.3.2. CIB (Centre Interfacultaire Bernoulli)

A very old collaboration of Inria with ecologists (the COREV network presently animated by R. Arditi) initiated (at the beginning of the 90s) by J-L. Gouzé and C. Lobry within the framework of Comore Inria project-team, pursued then by Mere and Comore raised very recently an important success: the half-year "Mathematics and computer sciences in theoretical ecology" which we co-organize with R. Arditi (associated with D. de Angelis and L. Ginzburg) at the Federal Polytechnical School of Lausanne (Centre Interfacultaire Bernoulli). The organization of this half-year (in July-December 2014) and the preparation of the acts will mobilize a great part of our activity for the coming two years. It should gather around sixty specialists during a half-dozen workshops. If additional funds are obtained from other sponsors we hope to welcome for the totality of the semester half a dozen post-doc.

7.5. International Research Visitors

Imme Van Den Berg (Univ. of Évora, Portugal) from Oct. 2013 until Feb. 2014: Construction, analysis and simulation of population dynamics models.

Nihel Ben Amar (ENIT, Tunis, Tunisia) from September 2013 to October 2013: Bioprocess modeling.

Boumédiène Benyahia (Univ. Tlemcen, Algeria) from January 2013 to October 2013: Bioprocess modelling.

Abdoudramane Guiro (Univ. Ougadougou, Burkina Fasso) from October 2013 to December 2013: Construction, analysis and simulation of dynamical models of populations.

7.5.1. Visits to International Teams

Coralie Fritsch as obtained a grant in the context of the Agreenium program [[15]] to visit Pr. Otso Ovaskainen's mathematical biology group (Univ. of Helsinki) from September to December 2013.

[15] http://www.agreenium.org

MORPHEME Project-Team

6. Partnerships and Cooperations

6.1. Regional Initiatives

- We started a collaboration with the team TIRO (Transporteurs en Imagerie et Radiothérapie en Oncologie), CEA/UNS/Centre Antoine Lacassagne, Nice, concerning the detection of tumorous cells in kidney histopathology (see Fig. 17). Although the images have a very high resolution, the problem is extremely difficult due to the similarity between different type of cells.

  A coarse-to-fine approach seems perfectly adapted since the acquisitions are performed at several resolutions. Typically, six resolutions are available (see Table 1). However, contrarily to what is usually done, we do not plan to develop a unique approach, to apply it to the coarser resolution, and to use the corresponding result projected onto the following resolution as the initialization of the next step. Our idea is to think of which approach to take at each resolution level, and to gradually improve the detection confidence from "this broad area might contain tumorous cells" to "with high confidence, this small, finely delineated region is a tumorous cell". For example, we might start with histogram analysis or simple thresholding methods on the coarser resolution. Then, texture analysis could be performed in intermediate resolutions. Finally, fine radiometric and shape analyses could be done on the full resolution image to achieve object-level detection.
- We have a collaboration with the Laboratoire d'Océanographie de Villefranche (LOV), CNRS/Université Pierre et Marie Curie, concerning automatic classification of zooplankton organisms for an embedded system called UVP for Underwater Vision Profiler (see Section 4.12).
- We have a collaboration with IPMC (H. Barelli) on vesicules tracking for characterizing cell membrane properties (see Section 4.7).

Table 1. Typical resolutions of the acquisitions in kidney histopathology.

	Full res.	Res. 1	Res. 2	Res. 3	Res. 4	Low res.
Width (rounded)	95 000	25 000	6000	1500	370	90
Height (rounded)	70 000	18 000	4500	1100	275	70
1-D downsampling factor	1	4	16	64	256	1024

6.2. National Initiatives

6.2.1. LABEX SIGNALIFE

The MORPHEME team is member of the SIGNALIFE Laboratory of Excellence.

6.2.2. ANR DIAMOND

Participants: Laure Blanc-Féraud [PI], Saima Ben Hadj.

In collaboration with the Pasteur Institute (Jean-Chritophe Olivo Marin) , the MIPS laboratory of Université de Haute Alsace (Alain Dieterlen, Bruno Colicchio) , the LIGM of Université Paris-Est (Jean-Christophe Pesquet, Caroline Chaux, Hugues Talbot), and INRA Sophia-Antipolis (Gilbert Engler). Details on the (website)

6.2.3. ANR MOTIMO

Participants: Laure Blanc-Féraud, Xavier Descombes, Eric Debreuve, Huei Fang Yang, Ana Rita Lopes Simoes.

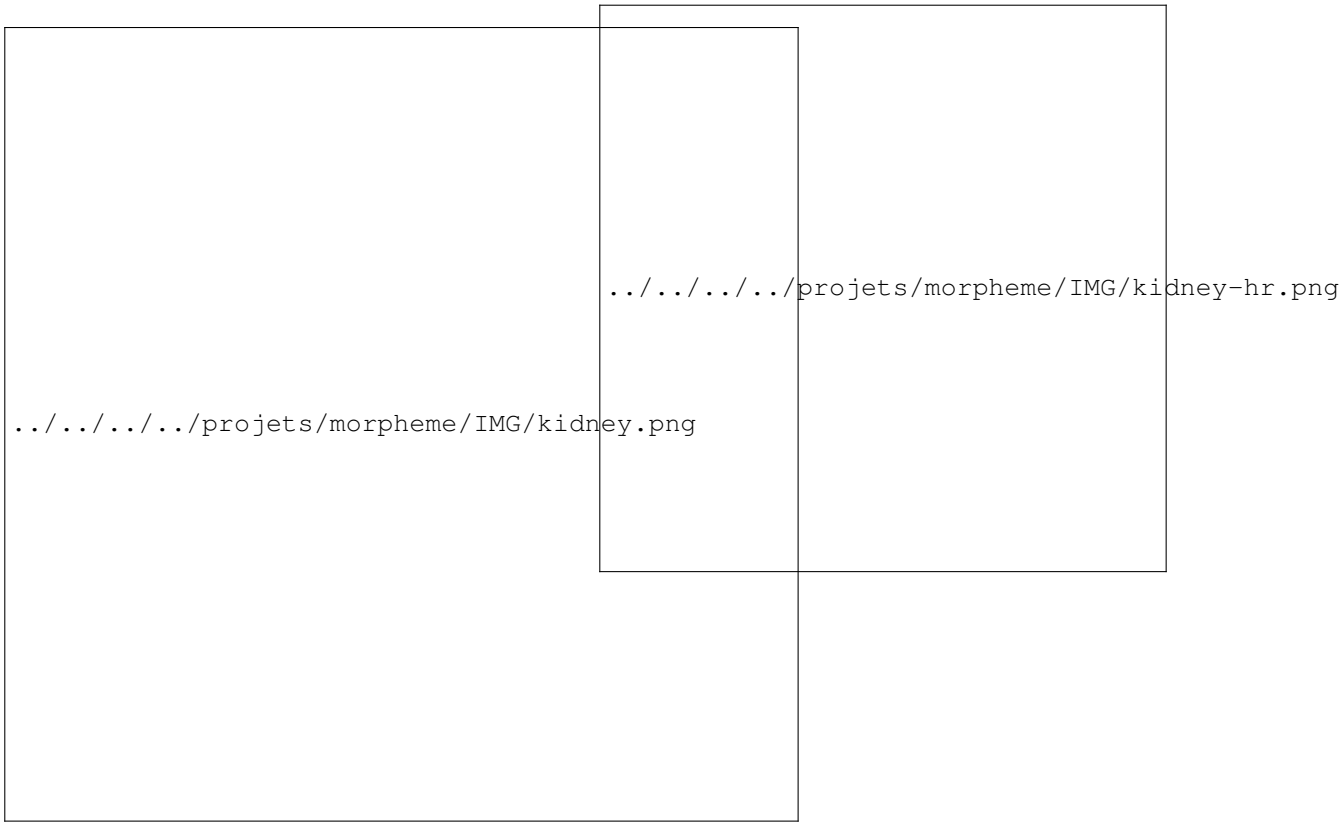

Figure 17. An example of image acquired for kidney histopathology. Left: low resolution; Right: intermediate resolution.

In collaboration with Institut de Mathématiques de Toulouse, INRA, Institut de Mécanique des Fluides de Toulouse, Laboratoire J-A Dieudonné, et IMV Technologies (PME). Details on the (website)

6.2.4. ANR POXADRONO

Participants: Florence Besse [PI], Xavier Descombes, Laure Blanc-Féraud.

The young researcher ANR project POXADRONO is in collaboration with Caroline Medioni, Hélène Bruckert, Giovanni Marchetti, Charlène Perrois and Lucile Palin from iBV. It aims at studying ARN regulation in the control of growth and axonal guidance by using a combination of live-imaging, quantitative analysis of images, bio-informatic analysis and genetic screening.

6.2.5. Inria Large-scale initiative Morphogenetics

Participants: Grégoire Malandain, Xavier Descombes, Gaël Michelin.

This action gathers the expertise of three Inria research teams (Virtual Plants, Morpheme, and Evasion) and other groups (RDP (ENS-CNRS–INRA, Lyon), RFD (CEA-INRA-CNRS, Grenoble)) and aimed at understanding how shape and architecture in plants are controlled by genes during development. To do so, we will study the spatio-temporal relationship between genetic regulation and plant shape utilizing recently developed imaging techniques together with molecular genetics and computational modelling. Rather than concentrating on the molecular networks, the project will study plant development across scales. In this context we will focus on the Arabidopsis flower, currently one of the best-characterised plant systems.

6.2.6. PEPII 1

Participants: Laure Blanc-Féraud, Xavier Descombes [PI], Alejandro Mottini.

This project aims at studying graphs in biological context (axons, vascular networks ...). In collaboration with Institut de Mécanique des Fluides de Toulouse, CerCo (Toulouse) .

6.2.7. PEPII 2

Participants: Laure Blanc-Féraud [PI], Xavier Descombes, Eric Debreuve.

In collaboration with Institut de Mathématiques de Toulouse, INRA, Institut de Mécanique des Fluides de Toulouse, Laboratoire J-A Dieudonné, et IMV Technologies (PME).

6.3. International Research Visitors

6.3.1. Visits of International Scientists

- Evgueny Pechersky from IITP Moscow (Russian Academy of Science) was invited one week in december.

6.3.1.1. Internships

- Vladimir Gutov : Master BioComp, UNS, Curves and Trees classification using SVM. Supervisors: E. Debreuve, X. Descombes.
- Gael Michelin : ENSEEIHT, Planar structures detection and tracking in biological images. Supervisor: Grégoire Malandain.
- Emmanuel Soubies : INSA Toulouse, Numerical methods for 3D biological structures reconstruction in fluorescent microscopy. Supervisors: L. Blanc-Féraud, Gilles Aubert.
- Nektaria Pappa : Master BioComp, UNS, Lobule detection from confocal microscopy images. Supervisor X. Descombes (with F. Plouraboué from IMFT)
- Anirudh Chakravarthi : Master BioComp, UNS, Dendrties dection from confocal microscopy images. Supervisor X. Descombes (with M. Studer from iBV).

6.3.2. Visits to International Teams

- Xavier has visited the Bristol University during one week in december. He was a Benjamin Maeker invited professor.

NACHOS Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. Inria Project Lab

8.1.1.1. C2S@Exa - Computer and Computational Scienecs at Exascale

Participants: Olivier Aumage [RUNTIME project-team, Inria Bordeaux - Sud-Ouest], Jocelyne Erhel [SAGE project-team, Inria Rennes - Bretagne Atlantique], Philippe Helluy [TONUS project-team, Inria Nancy - Grand-Est], Laura Grigori [ALPINE project-team, Inria Saclay - Île-de-France], Jean-Yves L'excellent [ROMA project-team, Inria Grenoble - Rhône-Alpes], Thierry Gautier [MOAIS project-team, Inria Grenoble - Rhône-Alpes], Luc Giraud [HIEPACS project-team, Inria Bordeaux - Sud-Ouest], Michel Kern [POMDAPI project-team, Inria Paris - Rocquencourt], Stéphane Lanteri [Coordinator of the project], François Pellegrini [BACCHUS project-team, Inria Bordeaux - Sud-Ouest], Christian Perez [AVALON project-team, Inria Grenoble - Rhône-Alpes], Frédéric Vivien [ROMA project-team, Inria Grenoble - Rhône-Alpes].

Since January 2013, the team is coordinating the C2S@Exa http://www-sop.inria.fr/c2s_at_exa Inria Project Lab (IPL). This national initiative aims at the development of numerical modeling methodologies that fully exploit the processing capabilities of modern massively parallel architectures in the context of a number of selected applications related to important scientific and technological challenges for the quality and the security of life in our society. At the current state of the art in technologies and methodologies, a multidisciplinary approach is required to overcome the challenges raised by the development of highly scalable numerical simulation software that can exploit computing platforms offering several hundreds of thousands of cores. Hence, the main objective of C2S@Exa is the establishment of a continuum of expertise in the computer science and numerical mathematics domains, by gathering researchers from Inria project-teams whose research and development activities are tightly linked to high performance computing issues in these domains. More precisely, this collaborative effort involves computer scientists that are experts of programming models, environments and tools for harnessing massively parallel systems, algorithmists that propose algorithms and contribute to generic libraries and core solvers in order to take benefit from all the parallelism levels with the main goal of optimal scaling on very large numbers of computing entities and, numerical mathematicians that are studying numerical schemes and scalable solvers for systems of partial differential equations in view of the simulation of very large-scale problems.

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. DEEP-ER

Type: COOPERATION

Defi: Exascale computing platforms, software and applications

Instrument: Integrated Project

Objectif: Dynamic Exascale Entry Platform - Extended Reach

Duration: October 2013 - September 2016

Coordinator: Forschungszentrum Juelich Gmbh (Germany)

Partner: Intel Gmbh (Germany), Bayerische Akademie der Wissenschaften (Germany), Ruprecht-Karls-Universitaet Heidelberg (Germany), Universitaet Regensburg (Germany), Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung E.V (Germany), Eurotech Spa (Italy), Consorzio Interuniversitario Cineca (Italy), Barcelona Supercomputing Center - Centro Nacional de Supercomputacion (Spain), Xyratex Technology Limited (United Kingdom), Katholieke Universiteit Leuven (Belgium), Stichting Astronomisch Onderzoek in Nederland (The Netherlands) and Inria (France).

Inria contact: Stephane Lanteri

Abstract: the DEEP-ER project aims at extending the Cluster-Booster Architecture that has been developed within the DEEP project with a highly scalable, efficient, easy-to-use parallel I/O system and resiliency mechanisms. A Prototype will be constructed leveraging advances in hardware components and integrate new storage technologies. They will be the basis to develop a highly scalable, efficient and user-friendly parallel I/O system tailored to HPC applications. Building on this I/O functionality a unified user-level checkpointing system with reduced overhead will be developed, exploiting multiple levels of storage. The DEEP programming model will be extended to introduce easy-to-use annotations to control checkpointing, and to combine automatic re-execution of failed tasks and recovery of long-running tasks from multi-level checkpoint. The requirements of HPC codes with regards to I/O and resiliency will guide the design of the DEEP-ER hardware and software components. Seven applications will be optimised for the DEEP-ER Prototype to demonstrate and validate the benefits of the DEEP-ER extensions to the Cluster-Booster Architecture.

8.2.2. Collaborations with Major European Organizations

Prof. Martin Gander: University of Geneva, Mathematics section (Switzerland)

Domain decomposition methods (optimized Schwarz algorithms) for the solution of the frequency domain Maxwell equations

Dr. Maciej Klemm: University of Bristol, Communication Systems & Networks Laboratory, Centre for Communications Research (United Kingdom)

Numerical modeling of the propagation of electromagnetic waves at the nanoscale for biomedical applications

8.3. International Initiatives

8.3.1. Participation In other International Programs

8.3.1.1. CNPq-Inria HOSCAR project

Participants: Reza Akbarinia [ZENITH project-team, Inria Sophia Antipolis - Méditerranée], Rossana Andrade [CSD/UFC], Hélène Barucq [MAGIQUE3D project-team, Inria Bordeaux - Sud-Ouest], Alvaro Coutinho [COPPE/UFR], Juklien Diaz [MAGIQUE3D project-team, Inria Bordeaux - Sud-Ouest], Thierry Gautier [MOAIS project-team, Inria Grenoble - Rhone-Alpes], Antônio Tadeu Gomes [LNCC], Pedroedro Leite Da Silva Dias [LNCC, Coordinator of the project on the Brazilian side], Luc Giraud [HIEPACS project-team, Inria Bordeaux - Sud-Ouest], Stéphane Lanteri [Coordinator of the project on the French side], Alexandre Madureira [LNCC], Nicolas Maillard [INF/UFRG], Florent Masseglia [ZENITH project-team, Inria Sophia Antipolis - Méditerranée], Marta Mattoso [COPPE/UFR], Philippe Navaux [INF/UFRG], Esther Pacitti [ZENITH project-team, Inria Sophia Antipolis - Méditerranée], François Pellegrini [BACCHUS project-team, Inria Bordeaux - Sud-Ouest], Fabio Porto [LNCC], Bruno Raffin [MOAIS project-team, Inria Grenoble - Rhone-Alpes], Pierre Ramet [HIEPACS project-team, Inria Bordeaux - Sud-Ouest], Jean-Louis Roch [MOAIS project-team, Inria Grenoble - Rhone-Alpes], Patrick Valduriez [ZENITH project-team, Inria Sophia Antipolis - Méditerranée], Frédéric Valentin [LNCC].

Since July 2012, the team is coordinating the HOSCAR http://www-sop.inria.fr/hoscar Brazil-France collaborative project. he HOSCAR project is a CNPq - Inria collaborative project between Brazilian and French researchers, in the field of computational sciences. The project is also sponsored by the French Embassy in Brazil.

The general objective of the project is to setup a multidisciplinary Brazil-France collaborative effort for taking full benefits of future high-performance massively parallel architectures. The targets are the very large-scale datasets and numerical simulations relevant to a selected set of applications in natural sciences: (i) resource prospection, (ii) reservoir simulation, (iii) ecological modeling, (iv) astronomy data management, and (v) simulation data management. The project involves computer scientists and numerical mathematicians divided in 3 fundamental research groups: (i) numerical schemes for PDE models (Group 1), (ii) scientific data management (Group 2), and (iii) high-performance software systems (Group 3). Several Brazilian institutions are participating to the project among which: LNCC (Laboratório Nacional de Computaçäo Científica), COPPE/UFRJ (Instituto Alberto Luiz Coimbra de Pós-Graduaçäo e Pesquisa de Engenharia/Alberto Luiz Coimbra Institute for Grad<uate Studies and Research in Engineering, Universidade Federal do Rio de Janeiro), INF/UFRGS (Instituto de Informática, Universidade Federal do Rio Grande do Sul) and LIA/UFC (Laboratórios de Pesquisa em Ciência da Computaçäo Departamento de Computaçäo, Universidade Federal do Ceará). The French partners are research teams from several Inria research centers.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

Prof. Kurt Busch, Theoretical Optics & Photonics, Humboldt-Universität zu Berlin, July 4-5

Prof. Martin Gander, University of Geneva, Switzerland, July 1-12

Prof. Jay Gopalakrishnan, Portland University, USA, July 15-19

Dr. Maciej Klemm, University of Bristol, UK, July 29-August 2

Dr. Antoine Moreau, Institut Pascal, Université Blaise Pascal, June 11-12

8.4.1.1. Internships

Anis Ben El Haj Midani Mohamed, ENIT-LAMSIN, Tunisia, April 30-July 31

Nicole Olivares, Mathematics Department, Portland University, Oregon, USA, JUne 11-Auguts 21

8.4.2. Visits to International Teams

Stéphane Lanteri, School of Mathematical Sciences, Institute of Computational Sciences, University of Electronic Science and Technology of China Chengdu, June 2-7

Stéphane Lanteri, Laboratory for Computational Mathematics, Center of Mathematics, and Institute for Biomedical Imaging and Life Sciences, Coimbra University, Portugal, October 27-November 1

NEUROMATHCOMP Project-Team

6. Partnerships and Cooperations

6.1. National Initiatives

6.1.1. ANR

6.1.1.1. KEOPS

See section "International Initiatives" below.

6.2. European Initiatives

6.2.1. FP7 Projects

6.2.1.1. BRAINSCALES

Title: BrainScaleS: Brain-inspired multiscale computation in neuromorphic hybrid systems

Type: COOPERATION (ICT)

Defi: Brain-inspired multiscale computation in neuromorphic hybrid systems

Instrument: Integrated Project (IP)

Objectif: FET proactive 8: Brain Inspired ICT

Duration: January 2011 - December 2014

Coordinator: Universitaet Ruprecht- Karls Heidelberg (Germany)

Other Partners: Nederlandse Akademie van Wetenschappen, Amsterdam; Universitetet For Miljo Og Biovitenskap, Aas; Universitat Pompeu Fabra, Barcelona; University of Cambridge; Debreceni Egyetem, Debrecen; Technische Universität Dresden; CNRS-UNIC, Gif-sur- Yvette; CNRS-INCM, Marseille; CNRS-ISM, Marseille; TUG, Graz; Ruprecht-Karls-Universität Heidelberg; Forschungszentrum Jülich GmbH, Jülich; EPFL LCN, Lausanne; EPFL- BBP, Lausanne; The University Of Manchester, Manchester; KTH, Stockholm; Universität Zürich.

See also http://brainscales.kip.uni-heidelberg.de/

Inria contact: Olivier Faugeras

Abstract: The BrainScaleS project aims at understanding function and interaction of multiple spatial and temporal scales in brain information processing. The fundamentally new approach of BrainScaleS lies in the in-vivo biological experimentation and computational analysis. Spatial scales range from individual neurons over larger neuron populations to entire functional brain areas. Temporal scales range from milliseconds relevant for event based plasticity mechanisms to hours or days relevant for learning and development. In the project generic theoretical principles will be extracted to enable an artificial synthesis of cortical-like cognitive skills. Both, numerical simulations on petaflop supercomputers and a fundamentally different non-von Neumann hardware architecture will be employed for this purpose. Neurobiological data from the early perceptual visual and somatosensory systems will be combined with data from specifically targeted higher cortical areas. Functional databases as well as novel project-specific experimental tools and protocols will be developed and used. New theoretical concepts and methods will be developed for understanding the computational role of the complex multi-scale dynamics of neural systems in-vivo. Innovative in-vivo experiments will be carried out to guide this analytical understanding. Multiscale architectures will be synthesized into a non-von Neumann computing device realised in custom designed electronic hardware. The proposed Hybrid Multiscale Computing Facility (HMF) combines microscopic neuromorphic physical model circuits with numerically calculated mesoscopic and macroscopic functional units

and a virtual environment providing sensory, decision-making and motor interfaces. The project also plans to employ petaflop supercomputing to obtain new insights into the specific properties of the different hardware architectures. A set of demonstration experiments will link multiscale analysis of biological systems with functionally and architecturally equivalent synthetic systems and offer the possibility for quantitative statements on the validity of theories bridging multiple scales. The demonstration experiments will also explore non-von Neumann computing outside the realm of brain-science. BrainScaleS will establish close links with the EU Brain-i-Nets and the Blue Brain project at the EPFL Lausanne. The consortium consists of a core group of 10 partners with 13 individual groups. Together with other projects and groups the BrainScaleS consortium plans to make important contributions to the preparation of a FET flagship project. This project will address the understanding and exploitation of information processing in the human brain as one of the major intellectual challenges of humanity with vast potential applications.

This project started on January 1st, 2011 and is funded for four years.

6.2.1.2. MATHEMACS

Title: Mathematics of Multilevel Anticipatory Complex Systems

Type: Collaborative project (generic) (FP7-ICT)

Defi: develop a mathematical theory of complex multilevel systems and their dynamics.

Instrument: Integrated Project (IP)

Duration: October 2012 - September 2015

Coordinator: Fatihcan Atay, Max Planck Institute for Mathematics in the Sciences, Leipzig (Germany)

Other Partners: Max Planck Institute for Mathematics in the Sciences (Leipzig, Germany), Universität Bielefeld (Germany), Chalmers University of Technology (Gothenburg, Sweden), Ca'Foscari University of Venice (Italy), Università Politecnica delle Marche (Ancona, Italy).

See also: http://www.mathemacs.eu/description.html

Inria contact: Olivier Faugeras

Abstract: The MATHEMACS project aims to develop a mathematical theory of complex multi-level systems and their dynamics. This is done through a general formulation based on the mathematical tools of information and dynamical systems theories. To ensure that the theoretical framework is at the same time practically applicable, three key application areas are represented within the project, namely neurobiology, human communication, and economics. These areas not only provide some of the best-known epitomes of complex multi-level systems, but also constitute a challenging test bed for validating the generality of the theory since they span a vast range of spatial and temporal scales. Furthermore, they have an important common aspect; namely, their complexity and self-organizational character is partly due to the anticipatory and predictive actions of their constituent units. The MATHEMACS project contends that the concepts of anticipation and prediction are particularly relevant for multi-level systems since they often involve different levels. Thus, as a further unique feature, the project includes the mathematical representation and modeling of anticipation in its agenda for understanding complex multi-level systems.

This project started on October 1st, 2012 and is funded for four years.

6.2.1.3. RENVISION

Type: COOPERATION, FP7 FET (Future Emerging technology) proactive program: Neuro-Bio-Inspired Systems Call 9 Objective 9.11

Defi: Retina-inspired ENcoding for advanced VISION tasks (RENVISION)

Instrument: Specific Targeted Research Project

Duration: March 2013 - February 2016

Coordinator: Vittorio Murino, PAVIS, IIT (Italy)

Partner: PAVIS, IIT (Italy), NBT, IIT (Italy), NAPH, IIT (Italy), The Institute of Neuroscience, Newcastle University (UK), Institute for Adaptive and Neural Computation, The University of Edimburgh (UK), Neuromathcomp project-team, Inria (France)

Inria contact: Pierre Kornprobst

Abstract: The retina is a sophisticated distributed processing unit of the central nervous system encoding visual stimuli in a highly parallel, adaptive and computationally efficient way. Recent studies show that rather than being a simple spatiotemporal filter that encodes visual information, the retina performs sophisticated non-linear computations extracting specific spatio-temporal stimulus features in a highly selective manner (e.g. motion selectivity). Understanding the neurobiological principles beyond retinal functionality is essential to develop successful artificial computer vision architectures.

RENVISION's goal is, therefore, twofold:

- To achieve a comprehensive understanding of how the retina encodes visual information through the different cellular layers;
- To use such insights to develop a retina-inspired computational approach to high-level computer vision tasks.

To this aim, exploiting the recent advances in high-resolution light microscopy 3D imaging and high-density multielectrode array technologies, RENVISION will be in an unprecedented position to investigate pan-retinal signal processing at high spatio-temporal resolution, integrating these two technologies in a novel experimental setup. This will allow for simultaneous recording from the entire population of ganglion cells and functional imaging of inner retinal layers at near-cellular resolution, combined with 3D structural imaging of the whole inner retina. The combined analysis of these complex datasets will require the development of novel multimodal analysis methods.

Resting on these neuroscientific and computational grounds, RENVISION will generate new knowledge on retinal processing. It will provide advanced pattern recognition and machine learning technologies to ICTs by shedding a new light on how the output of retinal processing (natural or modelled) allows solving complex vision tasks such as automated scene categorization and human action recognition.

6.2.1.4. HBP

Type: COOPERATION, FET Flagship' project

Defi: Understanding the brain

Instrument: FET Flagship' project

Duration: October 2013 - March 2016

Coordinator: EPFL (Switzerland)

Partner: see http://www.humanbrainproject.eu.

Inria contact: Olivier Faugeras

Abstract: The Human Brain Project (HBP) is supported by the European Union as a 'FET Flagship' project and the 86 institutions involved will receive one billion euro in funding over ten years. HBP should lay the technical foundations for a new model of ICT-based brain research, driving integration between data and knowledge from different disciplines, and catalysing a community effort to achieve a new understanding of the brain, new treatments for brain disease and new brain-like computing technologies. http://www.humanbrainproject.eu

6.2.1.5. NERVI

Program: ERC IDEAS

Project acronym: NerVi

Project title: From single neurons to visual perception

Coordinator: Olivier Faugeras

Duration: January 2009 - December 2013

Abstract: The project is to develop a formal model of information representation and processing in the part of the neocortex that is mostly concerned with visual information. This model will open new horizons in a well-principled way in the fields of artificial and biological vision as well as in computational neuroscience. Specifically the goal is to develop a universally accepted formal framework for describing complex, distributed and hierarchical processes capable of processing seamlessly a continuous flow of images. This framework features notably computational units operating at several spatiotemporal scales on stochastic data arising from natural images. Mean-field theory and stochastic calculus are used to harness the fundamental stochastic nature of the data, functional analysis and bifurcation theory to map the complexity of the behaviours of these assemblies of units. In the absence of such foundations, the development of an understanding of visual information processing in man and machines could be greatly hindered. Although the proposal addresses fundamental problems, its goal is to serve as the basis for ground-breaking future computational development for managing visual data and as a theoretical framework for a scientific understanding of biological vision.

6.2.1.6. FACETS-ITN

Title: FACETS-ITN

Instrument: Initial Training Network (ITN)

Duration: September 2009 - August 2013

Coordinator: Universität Heidelberg- Ruprecht-Karls (Germany)

Inria contact: O. Faugeras

See also http://facets.kip.uni-heidelberg.de/ITN/index.html

This 'Marie-Curie Initial Training Network' (funded by the EU) involves 15 groups at European Research Universities, Research Centers and Industrial Partners in 6 countries. Website: http://facets.kip.uni-heidelberg.de/ ITN/index.html

6.3. International Initiatives

6.3.1. Inria Associate Teams

6.3.1.1. CORTINA

Title: Retina neural network coding

Inria principal investigator: Bruno CESSAC

International Partner (Institution - Laboratory - Researcher):

Technical University Federico Santa Maria, Valparaíso (Chile) - Electronics Engeneering Department - Bruno CESSAC

Duration: 2011 - 2013

See also: http://cortex.loria.fr/Projects/Cortina

Much progress has been made in the last decades in understanding the basic organization and function of the nervous system in general. Contributions to this end have come from various domains including computational neuroscience and numerical science of the information in general. The goal of this associate team is to combine our complementary expertise, from experimental biology and mathematical models (U de Valparaiso and U Federico Santa-Maria) to computational neuroscience (CORTEX and NEUROMATHCOMP), in order to develop numerical tools for the study and characterization of neural coding and related sensory-motor loops. Recording and modeling spike trains from the retina neural network, an accessible part of the brain, is a difficult task that our partnership

can address, what constitute an excellent and unique opportunity to work together sharing our experience and to focus in developing computational tools for methodological innovations. To understand how the neural spike coding from natural image sequences works we are addressing the following issues: How visual signals are coded at earlier steps in the case of natural vision? What are their functions? What are the computational coding principles explaining (in artificial or biological system) the statistical properties of natural images? We wish to advance our actual knowledge in natural and artificial visual signals processing and apply it to the field of education; to foster better capacities for learning and memory; sensory prosthesis design, to will help unpaired sensory persons to sense the world and physical rehabilitation, among others. In the context of the cooperation between the Inria and Chile, we propose to develop new neural decoding algorithms that are transverse to several field and applications.

6.3.2. Inria International Partners

6.3.2.1. Declared Inria International Partners

Paul Bressloff, Professor of applied mathematics at the University of Utah (USA) specialising in mathematical neuroscience, has been selected for an Inria International Chair. He will be visiting the Sophia-Antipolis Méditerranée research center two months every year for five years, starting in 2014.

6.3.3. Participation In other International Programs

6.3.3.1. ANR KEOPS

Type: Algorithms for modeling the visual system: From natural vision to numerical applications.

Principal Investigator: Thierry Viéville (Mnemosyne)

International partner:

- Institution: University of Valparaiso (Chile)
- Laboratory: Centro Interdiciplinario de Neurociencia de Valparaiso
- Researcher: Adrian PALACIOS

International partner:

- Institution: UTFSM Valparaiso (Chile)
- Laboratory: Direccion General de Investigacion y Postgrado de Valparaiso
- Researcher: Maria-Jose ESCOBAR

Duration: 2011 - 2013

See also: http://cortex.loria.fr/Research/Keops

Abstract: KEOpS attempts to study and model the non-standard behavior of retinal (ganglion cells) sensors observed in natural scenarios. KEOpS also attempts to incorporate the resulting models into real engineering applications as new dynamical early-visual modules. The retina, an accessible part of the brain, is a unique model for studying the neural coding principles for natural scenarios. A recent study proposes that some visual functions (e.g. movement, orientation, anticipatory temporal prediction, contrast), thought to be the exclusive duty of higher brain centers, are actually carried at the retina level. The anatomical and physiological segregation of visual scenes into spatial, temporal and chromatic channels begins at the retina through the action of local neural networks. However, how the precise articulation of this neural network contributes to local solutions and global perception necessary to resolve natural task remains in general a mystery. KEOpS thus attempts to study the complexity of retinal ganglion cells (the output to the brain) behaviors observed in natural scenarios and to apply this result to artificial visual systems. We revisit both the retinal neural coding information sent to the brain, and at the same time, the development of new engineering applications inspired by the understanding of such neural encoding mechanisms. We develop an innovative formalism that takes the real (natural) complexity of retinal responses into account. We also develop new dynamical early-visual modules necessary to solve visual problems task.

6.4. International Research Visitors

6.4.1. Visits of International Scientists

- Alexander Cerquera, Universidad Antonio Nariño, Facultad de Ingeniería Electrónica y Biomédica, Colombia, 25-29/03/2013.
- Antonio Galves, Statistics Department. Instituto de Matemática e Estatística · Universidade de São Paulo. 25-27/06/2013.
- Eva Loecherbach, Maths department, Cergy University. 25-27/06/2013.

6.4.1.1. Internships

- Gaia Lombardi, M2 Internship, March-August 2013.

OASIS Project-Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. ANR SocEDA

Title: SOCial Event Driven Architecture

Program: Platform

Duration: July 2009 - October 2013

Coordinator: Linagora (ex EBM Web Sourcing)

Others partners: SMEs: ActiveEon, industry: Thales, OrangeLabs, academics: Inria, CNRS IMAG, LIRIS, ARMINES

See also: http://www.soceda.org/display/soceda/

Abstract: SocEDA is an ANR project of type Platform, also labelled by two competitiveness clusters, PEGASE and SCS. The aim is to provide a "Cloud based platform for large scale social aware Event-Driven Architecture (EDA)". OASIS is in charge of managing the storage and publication/subscription of events on the cloud.

7.1.2. ANR Songs

Title: Simulation of Next Generation Systems

Program: Infra 13

Duration: January 2012 - December 2015

Coordinator: Inria (Nancy, Grenoble, Bordeaux)

Others partners: IN2P3 Villeurbanne, LSIIT Strasbourg, I3S Sophia-Antipolis, LINA Nantes

See also: http://infra-songs.gforge.inria.fr/

Abstract: SONGS (2012-2015) is the continuity of SIMGRID project (2009-2012), in the ANR INFRA program. The aim of SONGS is to continue the development of the SimGrid simulation platform for the study of large distributed architectures, including data grids, cloud computing facilities, peer-to-peer applications and HPC/exascale architectures.

7.1.3. FUI CloudForce (now OpenCloudWare)

Program: FSN, labelled by Minalogic, Systematic and SCS.

Duration: January 2012 - December 2014

Coordinator: France-Telecom Research

Others partners: ActiveEon, Armines, Bull, eNovance, eXo Platform, France Telecom (coordinator), Inria, IRIT – INP Toulouse, Linagora, OW2, Peergreen, Télécom Paris Tech, Télécom Saint Etienne, Thales Communications, Thales Services, Université Joseph Fourier, Université de Savoie – LISTIC, UShareSoft

See also: http://www.opencloudware.org/

Abstract: The OpenCloudware project aims at building an open software engineering platform for the collaborative development of distributed applications to be deployed on multiple Cloud infrastructures.

The results of OpenCloudware will contain a set of software components to manage the lifecycle of such applications, from modelling (Think), developing and building images (Build), to a multi-IaaS compliant PaaS platform (Run) for their deployment, orchestration, performance testing, self-management (elasticity, green IT optimisation), and provisioning. Applications will be deployed potentially on multi IaaS (supporting either one IaaS at a time, or hybrid scenarios).The results of the project will be made available as open source components through the OW2 Open Source Cloudware initiative.

7.1.4. Oseo-Isis Spinnaker

Duration: June 2011 - May 2015

Coordinator: Tagsys-RFID

Others partners: SMEs: Inside-Secure, STIC, Legrand; Academic: IPG, ENS des Mines de St Etienne, Un. du Maine, Un, F. Rabelais Tours, AETS ESEO Angers, Un. Marne la Vallée, Un. Paris 6, Un. Rennes 1, Inria.

See also: http://www.spinnaker-rfid.com/

Abstract: The objective of Spinnaker is to really allow RFID technology to be widely and easily deployed. The role of the OASIS team in this project is to allow the wide scale deployment and management of the specific RFID application servers in the cloud, so to build an end-to-end robust and flexible solution using GCM technology.

7.2. European Initiatives

7.2.1. FP7 Projects

7.2.1.1. PLAY

Title: Pushing dynamic and ubiquitous interaction between services Leveraged in the future Internet by ApplYing complex event processing

Type: COOPERATION

Defi: Internet of Services, Software & Virtualisation

Instrument: Specific Targeted Research Project

Objectif: Internet of Services, Software and Virtualisation

Duration: October 2010 - September 2013

Coordinator: FZI (Germany)

Other Partners: EBM WebSourcing (Fr), Inria (OASIS and SARDES) (Fr), France Telecom/OrangeLabs (Fr), ICCS (Gr), Ecole des Mines Albi/Armines (Fr), CIM (Serbia).

Inria contact: Françoise Baude

See also: http://www.play-project.eu/

Abstract: The PLAY project aims to develop and validate an elastic and reliable architecture for dynamic and complex, event-driven interaction in large highly distributed and heterogeneous service systems. Such an architecture enables ubiquitous exchange of information between heterogeneous services, providing the possibilities to adapt and personalize their execution, resulting in the so-called situational-driven process adaptivity. The OASIS team is in charge of designing the key element of the PLAY Platform: the Event Cloud that is a publish/subscribe P2P based system, developed using the GCM technology.

7.2.1.2. FI-WARE

Type: COOPERATION

Defi: PPP FI: Technology Foundation: Future Internet Core Platform

Instrument: Integrated Project

Objectif: PPP FI: Technology Foundation:Future Internet Core Platform

Duration: September 2011 - May 2014

Coordinator: Telefonica (Spain)

Others partners: Thales, SAP, Inria

Inria contact: Olivier Festor

See also: http://www.fi-ware.eu/

Abstract: FI-WARE will deliver a novel service infrastructure, building upon elements (called Generic Enablers) which offer reusable and commonly shared functions making it easier to develop Future Internet Applications in multiple sectors. This infrastructure will bring significant and quantifiable improvements in the performance, reliability, and production costs linked to Internet applications, building a true foundation for the future Internet.

7.2.1.3. DC4Cities

Type: COOPERATION

Defi: FP7 Smartcities 2013

Instrument: Specific Targeted REsearch Project

Objectif: ICT-2013.6.2: Data Centers in an energy-efficientand environmentally friendly Internet

Duration: September 2013 - February 2016

Coordinator: Freemind Consulting (BE)

Partners: U. Mannheim (DE), U. Passau (DE), HP Italy Innovation Center (IT), Create-Net (IT), ENEA (IT), CESCA Catalunia (ES), Gas Natural SA (ES), Inst. Munic. Informatica Barcelona (ES), Inria (FR)

Inria contact: Eric Madelaine

See also:

Abstract: Data centres play two different and complementary roles in Smart Cities' energy policies: as ICT infrastructures supporting Smart City resource optimization systems - more in general, delivering ICT services to the citizens - and as large energy consumers. Therefore there are huge expectations on data centres being able to run at the highest levels of renewable energy sources: this is the great challenge of DC4Cities project.
The goal of DC4Cities is to make existing and new data centres energy adaptive, without requiring any modification to the logistics, and without impacting the quality of the services provided to their users. Finally new energy metrics, benchmarks, and measurement methodologies will be developed and proposed for the definition of new related standards. DC4Cities will promote the data centres role as an "eco-friendly" key player in the Smart Cities energy policies, and will foster the integration of a network of local renewable energy providers (also interconnected with local Smart Grids and Micro Grids) to support the pursued increase of renewable energy share.

7.2.2. Collaborations in European Programs, except FP7

Program: EIT ICTLabs

Project acronym: Activity 13 052 from Intelligent Mobility and Transportation Systems action line (IMS), renamed Future Urban Life and Mobility (ULM) mid 2013

Project title: Multimodal Mobility

Duration: 2013, January to December

Coordinator: F. Baude and B. Kwella (Fraunhofer Gesellschaft)

Other partners: Inria, BME (Hungary), TUBerlin, U. Bologna, Telecom Italia, Siemens/VMZ (Germany), DFKI (Germany)

Abstract: The activity seeks to specify the building blocks, a platform and a prototype for the provision of multimodal mobility. The main motivation is to facilitate the use of ICT to support the efficient organization of Accessible Mobility (support for people with special needs, economical optimization of mobility and transportation, trip planning, information on available transport modes, etc). It therefore provides the basis for sustainable future mobility

7.3. International Initiatives

7.3.1. Inria Associate Teams

7.3.1.1. DISSIMINET

Title: Web-Service approaches for simulation

Inria principal investigator: Olivier Dalle

International Partner (Institution - Laboratory - Researcher):

Carleton University (Canada) - Advanced Real-Time Simulation Laboratory - Gabriel Wainer

Duration: 2011 - 2013

See also: http://www.inria.fr/en/teams/dissiminet

This Franco-Canadian team will advance research on the definition of new algorithms and techniques for component-based simulation using a web-services based approach. On one hand, the use of web-services is expected to solve the critical issues that pave the way toward the simulation of systems of unprecedented complexity, especially (but not exclusively) in the studies involving large networks such as Peer-to-peer networks. Web-Service oriented approaches have numerous advantages, such as allowing the reuse of existing simulators, allowing non-computer experts to merge their respective knowledge, or seamless integration of complementary services (eg. on-line storage and repositories, weather forecast, traffic, etc.). One important expected outcome of this approach is to significantly improve the simulation methodology in network studies, especially by enforcing the seamless reproducibility and traceability of simulation results. On the other hand, a net-centric approach of simulation based on web-services comes at the cost of added complexity and incurs new practices, both at the technical and methodological levels. The results of this common research will be integrated into both teams' discrete-event distributed simulators: the CD++ simulator at Carleton University and the simulation middle-ware developed in the MASCOTTE EPI, called OSA, whose developments are supported by an Inria ADT starting in December 2011.

7.3.1.2. DAESD

Title: Distributed/Asynchronous, Embedded/synchronous System Development

Inria principal investigator: Eric Madelaine

International Partner (Institution - Laboratory - Researcher):

East China Normal University (ECNU) Shanghai - SEI - Yixiang Chen

Duration: 2012 - 2014

See also: http://team.inria.fr/DAESD

The development of concurrent and parallel systems has traditionally been clearly split in two different families; distributed and asynchronous systems on one hand, now growing very fast with the recent progress of the Internet towards large scale services and clouds; embedded, reactive, or hybrid systems on the other hand, mostly of synchronous behaviour. The frontier between these families has attracted less attention, but recent trends, e.g. in industrial systems, in "Cyber-Physical systems", or in the emerging "Internet of Things", give a new importance to research combining them.

The aim of the DAESD associate team is to combine the expertise of the Oasis and Aoste teams at Inria, the SEI-Shone team at ECNU-Shanghai, and to build models, methods, and prototype tools inheriting from synchronous and asynchronous models. We plan to address modelling formalisms and tools, for this combined model; to establish a method to analyze temporal and spatial consistency of embedded distributed real-time systems; to develop scheduling strategies for multiple tasks in embedded and distributed systems with mixed constraints.

7.3.1.3. SCADA

Title: Safe Composition of Autonomic Distributed Applications

Inria principal investigator: Ludovic Henrio

International Partner (Institution - Laboratory - Researcher):

University of Chile (Chile) - NIC Chile Research Labs - Javier Bustos

Duration: 2012 - 2014

See also: http://team.inria.fr/scada

The SCADA project aims at promoting the collaboration between NIC LABS (Santiago - Chile) and OASIS team (Inria Sophia Antipolis - France) in the domain of the safe composition of applications. More precisely the project will extend existing composition patterns dedicated to parallel or distributed computing to ease the reliable composition of applications. The strong interactions between formal aspects and practical implementation are a key feature of that project, where formal methods, and language theory will contribute to the practical implementation of execution platforms, development and debugging tools, and verification environments. The composition models we focus on are algorithmic skeletons, and distributed components; and we will particularly focus on the programming and verification of non-functional features. Overall, from formal specification and proofs, this project should lead to the implementation of tools for the design and execution of distributed and parallel applications with a guaranteed behavior.

7.3.2. Inria International Labs

7.3.2.1. CIRIC Chili

Ciric research line: Telecommunications

Inria principal investigator: Eric Madelaine

Duration: 2012 - 2021

This CIRIC activity is loosely coupled with our SCADA associated team with the Universidad de Chile (UdC). We have had some contacts with a software company in Santiago, and starting exploring some possible collaboration in the area of formal specification of distributed applications for Android systems, and generation of “safe by construction” android code. But the effective involvment of CIRIC manpower in this activity has not yet started.

7.3.2.2. LIAMA Shanghai

Liama project: HADES

Inria principal investigator: Robert de Simone

Oasis researchers involved: Eric Madelaine, Ludovic Henrio

Duration: 2013 - 2016

Modern computing architectures are becoming increasingly parallel, at all levels. Meanwhile, typical applications also display increasing concurrency aspects, specially streaming applications involving data and task parallelism. Cyber physical system interactions also add extra-functional requirements to this high degree of concurrency. The goal of best fitting applications onto architectures becomes a crucial problem, which must be tackled from any possible angle. Our position in the HADES LIAMA project is to consider modeling of applications using formal models of concurrent computation, and specialized model-driven engineering approaches to embody the design flow for such models (analysis, verification, mapping allocation, representation of non-functional properties and constraints). We build on various previous domains of expertise : synchronous languages for embedded system design, asynchronous languages for high-performance cloud computing, and real-time specification languages for cyber-physical interaction aspects.

In 2013, HADES and the DAESD associated team organised a joint "Spring School" at ECNU Shanghai, held in cunjunction with the official inaugural LIAMA Shanghai Open day.

7.4. International Research Visitors

7.4.1. Visits of International Scientists

Participant: Ass. Pr. Xavier Défago.

Date: from 16 Sep. 2013 to 31 Jan. 2014

Institution: Dependable Distributed Systems Lab., Japan Advanced Institute of Science and Technology (JAIST), Nomi, Ishikawa, Japan

This visit is founded by CNRS and shared between the OASIS and COATI teams.

Participant: Pr. Gabriel Wainer.

Date: from 14 Jun. to 13 Jul. 2013

Institution: Carleton University, Ottawa (CA)

This visit is in the context of our DISSIMINET associated team

Participant: Pr. Yixiang Chen.

Date: 14-17 Oct. 2013

Institution: East China Normal University, Shanghai (CN)

This visit is in the context of our DAESD associated team

Participant: Ass. Pr. Min Zhang.

Date: 11-16 Sep. 2013

Institution: East China Normal University, Shanghai (CN)

This visit is in the context of our DAESD associated team

Participant: Elena Giachino.

Date: 27-29 Mar. 2013

Institution: Univ. of Bologna

Subject: Collaborative work on deadlock analysis for ABS and ASP

Participant: Pr. Mizuhito Ogawa.

Date: 26-29 Mar. 2013

Institution: Dependable Distributed Systems Lab., Japan Advanced Institute of Science and Technology (JAIST), Nomi, Ishikawa, Japan.

Subject: Collaborative work on fundamental aspects of distributed computing and theorem proving techniques.

7.4.1.1. Internships

Yanwen Chen

Subject: Programmation d'applications hétérogènes embarquées et distribuées

Date: from Jan. 2013 until Jun. 2013

Institution: East China Normal University (China)

This visit is in the context of the cotutelle PhD of Yanwen Chen, under the direction of E. Madelaine.

Dongqian Liu

Subject: Generation of behavioural models in the VerCors platform

Date: from Oct. 2013 until Dec. 2013

Institution: East China Normal University (China)

This visit is in the context of the DAESD associated team.

Michel Jackson de Souza

Subject: Distributed coherent snapshot solution for the P2P CAN-based EventCloud

Date: from July 2012 until Aug. 2013

Institution: UFBA Federal University of Bahia (Brasil), Science sans Frontière brazilian mobility program

This visit is organized after spontaneous contacts, as a complementary work for the student bachelor studies.

OPALE Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR

8.1.1.1. Project "OMD2", Optimisation Multi-Disciplinaire Distribuèe (Distributed Multidisciplinary Optimization)

This project funded by ANR deals with the development of a software platform devoted to Multidisciplinary Design Optimization (MDO) in the context of distributed computing.

The notion of optimization platform based on distributed and parallel codes is undertaken with a distributed workflow management system running on a grid infrastructure using the GRID5000 middleware from Inria.

Renault is the coordinator of this project, which involves also EMSE, ENS Cachan, EC Nantes, Université de Technologie de Compiègne, CD-Adapco, Sirehna, Activeon, and Inria project Tao, Oasis and Opale. This contract provides the grant supporting two PhD theses (A. Zerbinati and L. Trifan)

8.1.2. Project "OASIS"

The OASIS project, Optimization of Addendum Surfaces In Stamping, is an R&D consortium (CS, Arcelor-Mittal, ErDF, Inria, UTC, EURODECISION, ESILV, NECS, DeltaCAD, SCILAB-DIGITEO) of the Pole Systemtic Paris-Region dedicated to develop an optimal design framework (methods-software platforms-applications) for stamping processes. The EPI OPALE/Inria is the leader within the consortium for the Optimization work-package (one of six WP), the role of which is to develop efficient tools well adapted to Pareto front identification of the multicriteria-dependent stamping processes.

The OASIS project yields 2.4 Meuro total financial support (one Ph.D thesis, two post-doctoral positions and 12 months internship for OPALE).

8.1.3. Project "Memoria"

This project is funded by the National Foundation for Aeronautics and Space (FNRAE). The partners are the University of Toulouse Paul-Sabatier and the CERFACS. The objective is to study optimization methods under uncertainty in the context of aerodynamic problems.

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. MARS

Title: Manipulation of Reynolds Stress

Type: COOPERATION (TRANSPORTS)

Instrument: Specific Targeted Research Project (STREP)

Duration: October 2010 - September 2013

Coordinator: CENTRE INTERNACIONAL DE METODES NUMERICS EN ENGINYERIA (Spain)

Others partners: USFD (UK), AIRBUS (SP), FOI (SW), ALENIA (IT), DLR (GER), CNRS (FR), DASSAULT (FR), NUMECA (BEL), UNIMAN (UK), EADS (UK)

See also: http://www.cimne.com/mars/

Abstract: The objective is to study flow control devices for aeronautical applications. This project gathers twelve European partners and twelve Chinese partners for a common work that includes both experimental and numerical studies. Opale project-team is in charge of developing numerical algorithms to optimize flow control devices (vortex generators, synthetic jets).

8.2.1.2. GRAIN 2

Type: COOPERATION

Defi: Transport (incl. Aeronautics)

Instrument: Coordination and Support Action (CSA)

Duration: October 2013 - September 2015

Coordinator: CENTRE INTERNACIONAL DE METODES NUMERICS EN ENGINYERIA (Spain)

Partner: AIRBUS (SP), ALENIA (I), EADS-IW (F), Rolls-Royce (UK), INGENIA (SP), NUMECA (B), U. SHEFFIELD (UK), U. BIRMINGHAM (UK), CIRA (I), VKI (B), AIRBORNE (NL), LEITAT (SP), CERFACS (F), U. CRANFIELD (UK), CAE (CN), GTE (CN), ARI (CN), FAI (CN), ASRI (CN), SAERI (CN), BIAM (CN), ACTRI (CN), BUAA (CN), NPU (CN), PKU (CN), NUAA (CN), ZJU (CN).

See also: http://www.cimne.com/grain2/

Inria contact: Toan Nguyen

Abstract: The main objective of GRAIN2 is to focus its greening activities following the Flight Path 2050 Vision for Aircraft en route to the very ambitious challenge "Protecting the environment and the energy supply" in three major following lines: i) greening the air vehicle, ii) greening the Air transport System and iii) Reducing the carbon foot print of aviation via sustainable alternative fuels. GRAIN2 will identify innovative R & D methods, tools and HPC environments (supercomputers and GPGPUs) in the different KGTs according to the needs of major aeronautical industries to deeper understand the mechanism of engine exhaust emissions, to improve fuel efficiency and environmental performance, to lower noise for landing gear and high lift surfaces, to introduce new materials with multiple functions, to help significantly the development of biofuels for greenhouse gas emission reduction, etc.

8.2.1.3. TraM3

Type: IDEAS

Title: TRaffic Management by Macroscopic Models

Instrument: ERC Starting Grant

Objectif: NC

Duration: October 2010 - September 2015

Coordinator: Inria

Inria contact: Paola Goatin

Abstract: The project intends to investigate traffic phenomena from the macroscopic point of view, using models derived from fluid-dynamics consisting in hyperbolic conservation laws. The scope is to develop a rigorous analytical framework and fast and efficient numerical tools for solving optimization and control problems, such as queues lengths control or buildings exits design. See also: http://www-sop.inria.fr/members/Paola.Goatin/tram3.html

8.2.2. Collaborations in European Programs, except FP7

Program: KIC EIT ITC Labs, IMTS Intelligent Mobility and Transportation Systems

Project title: Multimodal Mobility

Duration: January 2013 - December 2013

Coordinator: Françoise Baude (Inria/UNS), Birgit Kwella (Fraunhofer Fokus)

Other partners: TU Berlin, U. Bologna, Inria, BME, Fraunhofer Gesellschaft,Telecom Italia,Siemens

Abstract: Identify innovation levers and possible joint developments in IMS

8.3. International Initiatives

8.3.1. Inria Associate Teams

8.3.1.1. ORESTE

Title: Optimal REroute Strategies for Traffic managEment

Inria principal investigator: Paola Goatin

International Partner (Institution - Laboratory - Researcher):

University of California Berkeley (United States) - Electrical Engineering and Computer Science (EECS) - Paola Goatin

Duration: 2012 - 2014

See also: http://www-sop.inria.fr/members/Paola.Goatin/ORESTE/index.html

ORESTE is an associated team between OPALE project-team at Inria and the Mobile Millennium / Integrated Corridor Management (ICM) team at UC Berkeley focused on traffic management. With this project, we aim at processing GPS traffic data with up-to-date mathematical techniques to optimize traffic flows in corridors. More precisely, we seek for optimal reroute strategies to reduce freeway congestion employing the unused capacity of the secondary network. The project uses macroscopic traffic flow models and a discrete approach to solve the corresponding optimal control problems. The overall goal is to provide constructive results that can be implemented in practice. Both teams have actively contributed to recent advances in the subject, and we think their collaboration is now mature enough to take advantage of the associate team framework. The Inria team and its theoretical knowledge complement the Berkeley team, with its engineering knowledge anchored in practice.

8.3.2. Inria International Partners

8.3.2.1. Informal International Partners

Jean-Antoine Désidéri maintains close links with Prof. Alfio Borzí (Institut für Mathematik - Universität Würzburg, Germany) on theme of PDE-constrained optimization.

Régis Duvigneau maintains active cooperation with Praveen Chandrashkar (formely Opale post-doctoral fellow, now Assistant Professor at Tata Institute for Fundamental Research, Bangalore, Dept. Applicable Mathematics) on the theme of shape optimization in aerodynamics.

Additionally, Abderrahamane Habbal has a long term thorough collaboration with Moez Kallel from ENIT, Tunis, focusing on new applications of game theory to inverse problems and imaging science. We also have a continuing intensive collaboration with Rajae Aboulaich and Rachid Ellaia, from EMI, Rabat, and their collaborators. The themes addressed are multiobjective optimization, and mathematical modeling in life sciences.

8.3.3. Inria International Labs

- LIRIMA Team ANO 2010-2014:

  The agreement governing the creation of the International Laboratory for Research in Computer Science and Applied Mathematics (LIRIMA) was signed on 24th November 2009 in Yaoundé. LIRIMA enables cooperation between Inria research teams and teams in Africa (Sub-Saharan Africa and the Maghreb) to be reinforced. It is the continuation of the major operation undertaken by the SARIMA program (2004-08 Priority Solidarity Fund created by the French Ministry of Foreign & European Affairs).

  The LIRIMA team ANO : Numerical analysis of PDEs and Optimization is a partnership between Opale project and the EMI engineering college, Rabat / National Centre for Scientific and Technical Research (CNRST) Morocco. The Team leader is Prof. Rajae Aboulaïch, EMI. Other French participants are the Project Commands at Saclay, Palaiseau and the team-project DRACULA at Inria Lyon.

  The ANO team is composed of ten senior researchers from Morocco and ten senior researchers from France and more than fifteen PhD students.

  The themes investigated are biomathematics (Models for plants growth, cardiovascular and cerebral diseases, cardio image segmentation), mathematical finance (optimal portfolio, risk management, Islamic finance), multiobjective optimization in structural mechanics, and vehicle traffic and crowd motion. Refer to the website http://www.lirima.uninet.cm/index.php/en/ for more details on the LIRIMA Africa themes and teams.

8.3.4. Participation In other International Programs

- Inria@SILICONVALLEY :

  ORESTE Associated Team with UC Berkeley takes part to the program.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

8.4.1.1. Senior Researchers

Pr. Ellaia Rachid

Subject: Theory and algorithms for global and multiobjective optimization.

Institution: Ecole Mohammadia d'Ingénieurs (EMI) , Rabat (Morocco)

8.4.1.2. PhD Students

Legesse Lemecha Obsu

Subject: Macroscopic traffic flow optimization on roundabouts.

Institution: University of Addis Ababa (Ethiopia)

8.4.1.3. Internships

Bouthaina Yahyaoui, Asma Ghdami and Marwa Mokni

Subject: Multiobjective optimization of laminated composite Mindlin-Reissner plates

Institution: Institut Supérieur des Mathématiques Appliquées et d'Informatique, Kairouan, (Tunisia)

REVES Project-Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. ANR ALTA

Participants: Emmanuelle Chapoulie, Stefan Popov, George Drettakis.

The ANR ALTA project started in October 2011, and focuses on the development of novel algorithms for realistic and efficient global illumination. The project is coordinated by the Grenoble Inria group ARTIS (N.Holzschuch), and the Bordeaux Inria group MANAO (X. Granier) is also a partner. Our participation is the study of error bounds for these algorithms and the development of interactive global illumination, and the development of the new global illumination algorithm described in Sec. 5.1.3 .

7.1.2. ANR DRAO

Participants: Emmanuel Iarussi, Adrien Bousseau.

https://www-sop.inria.fr/members/Adrien.Bousseau/drao/

The ANR DRAO is a young researcher project coordinated by Adrien Bousseau, in collaboration with the InSitu project team at Inria Saclay - Ile de France (W. Mackay and T. Tsandilas) and the MANAO project team (P. Barla and G. Guennebaud) and POTIOC project team (M. Hachet) at Inria Bordeaux - Sud Ouest. The goal of this collaboration is to develop novel drawing tools for amateurs as well as for expert designers and illustrators, combining expertise in Computer Graphics (REVES and MANAO) and Human-Computer Interaction (InSitu, POTIOC). This ANR project funds the PhD of Emmanuel Iarussi.

The first part of the project will be to observe how people draw with existing tools. To do so we will conduct observational studies where we will interview designers and illustrators and collect data by videotaping drawing sessions and by recording drawings with digital pens. In the second part of the project we will deduce from our observations new user interfaces and rendering algorithms that automate part of the drawing process and enrich 2D drawings with realistic rendering capabilities. We will combine computer vision and computer graphics techniques to estimate geometric information from sketches. We will then use this information to guide rendering algorithms that generate plausible depictions of material and lighting over the drawing. In the third part of the project, we plan to develop computer-assisted drawing lessons to teach amateurs how to draw from photographs and 3D models. We will apply image analysis algorithms to estimate the structure of a photograph and use that structure as guidance for drawing. To summarize, the goal of the ANR DRAO project is to make amateurs more confident in their drawing skills and to allow expert designers to produce complex illustrations more effectively.

The ANR DRAO has resulted in two publications this year on assisting drawing from photographs [19] and vector drawing of stylized materials [14].

7.1.3. ANR SEMAPOLIS

Participant: George Drettakis.

This ANR project started in October 2013. The goal is to use semantic information to improve urban reconstruction and rendering. The consortium is led by ENPC (R. Marlet) and includes the Inria Willow team and the GREY-C laboratory on image processing. Our contribution will be in the rendering part.

7.2. European Initiatives

7.2.1. FP7 Projects

7.2.1.1. VERVE

Title: VERVE

Type: COOPERATION (ICT)

Defi: Services to promote E-inclusion using socially realistic virtual environments

Instrument: Integrated Project (IP)

Duration: October 2011 - September 2014

Coordinator: Trinity College - Dublin (Ireland)

Others partners: DFKI (Germany), CNRS-ParisTech (France), CNRS-IRCAM (France), U. of Zaragoza (Spain), Testaluna (IT), KAINOS (UK)

See also: http://www.verveconsortium.eu/

Abstract

Social exclusion has many causes, but major factors are the fear and apathy that often accompany a disability. The European e-Inclusion policy stresses the importance of ICT in improving the quality of life in potentially disadvantaged groups, including older people and persons with disabilities. In this project, we will develop ICT tools to support the treatment of people who are at risk of social exclusion due to fear and/or apathy associated with a disability. These tools will be in the form of personalised VR scenarios and serious games specifically designed for therapeutic targets and made broadly available via a novel integration of interactive 3D environments directly into Web browsers. We will perform cutting edge research into rendering and simulating personalised and populated VR environments, 3D web graphics, and serious games. These technical efforts will be underpinned by our clinical/laboratory and industry partners, who will be fully involved throughout in the requirements, design and evaluation of VERVE, and liaison with the stakeholders (i.e., participants, carers/family, and health professionals). They will implement the VERVE interventions in three use-cases, each targeting a different group of participants: fear of falling, apathy related to cognitive decline and behavioural disturbances, and other emotional disturbances linked to anxiety. While developing clinical assessment methods and interventions for the first two patient groups is our primary focus, our results will be applicable to a much wider range of potentially disadvantaged individuals.

For the second period (October 2012 - September 2013), the consortium continued the work on implementing and improving the different solutions for the three use-cases: fear, apathy and anxieties. Different technologies were developed:

- Kitchen, a serious game for apathy.
- Freezing of Gait, a serious game for fear.
- Fear of Falling, a serious game for fear.
- Crowd-Phobia, a virtual reality application for anxieties.
- Memory Motivation Virtual Experience (MeMoVE), virtual reality application for apathy.

In particular REVES was mainly involved in the second use-case with the MeMoVE scenario. During this second period, the IBR technique was ported to the Immersive Space on a single screen of the CAVE. Experiments with healthy adults were performed in collaboration with the hospital of Nice (CHUN). The results of these experiments will be published in IEEE VR2014.

7.2.1.2. CR-PLAY – Capture Reconstruct Play

Type: COOPERATION (ICT)

Instrument: Specific Targeted Research Project

Objectif: Creativity

Duration: November 2013 - October 2016

Coordinator: Testaluna SA (IT)

Partner: TU Darmstadt (DE), UC London (UK), U. Patras (GR), Miniclip UK, Cursor Oy (FI)

Inria contact: George Drettakis

Abstract: The goal of this project is to use image- and video-based rendering and relighting techniques in the context of games and in particular mobile or casual games. The computer graphics and vision partners (UCL, TUD) are leaders in their fields, and have developed algorithms allowing easy capture of scenes using images and video, and reconstruction using vision algorithms. UCL and Inria have developed image- and video-based rendering algorithms which can be useful for games. These tools need to be perfected, reducing artifacts and difficulty of use so that they can be useful and productive for games companies. For evaluation, the HCI lab of the University of Patras will provide cutting-edge methodologies to make the resulting systems useable. The consortium is led by the games company Testaluna, based in Genova Italy, with whom we have a solid working relationship from our previous VERVE project (see above). Other industrial partners include Cursor Oy (a regional group of games companies in Finland, which is a leader in Europe in Casual games) and Miniclip, which is one of the major players in the online game market.

7.3. International Initiatives

7.3.1. Inria Associate Teams

- EA CRISP http://www-sop.inria.fr/reves/crisp/

  The goal of the CRISP associate team between REVES and University of California (UC) Berkeley is to investigate novel ways to create, render and interact with images based on the study of human perception. This novel and emerging area has been the focus of ongoing collaborations between researchers from the REVES research group at Inria (Adrien Bousseau, George Drettakis) and researchers in Computer Science and Vision Science at UC Berkeley (Maneesh Agrawala, Ravi Ramamoorthi, Martin S. Banks (Human Vision Science)). All of the researchers involved in CRISP share a common interest in creating and manipulating effective synthetic imagery. To achieve this goal we focus on understanding how people perceive complex material, lighting and shape, on developing new rendering algorithms based on this understanding, and on building interactive tools that enable users to efficiently specify the kind of image they wish to create. More specifically, we explore the following research directions :

  Perception: Images are generated from the interaction of lighting, material, and geometry. We evaluate how people perceive material, lighting, and geometry in realistic images such as photographs, and non realistic images such as drawings and paintings. This knowledge of human perception is essential for developing efficient rendering algorithms and interaction tools that focus on the most important perceptual features of an image.

  Rendering: We develop rendering algorithms that generate images that are plausible with respect to the user's intent and allocate resources on the visual effects that best contribute to perception.

  Interaction: We facilitate the creation of material, lighting, and geometric effects in synthetic images by developing novel user interfaces for novice and professional users.

  Our contributions have the potential to benefit different applications of image creation such as illustration (archeology, architecture, education); entertainment (video games, movies) and design

(sketching, photograph editing). This research naturally falls in Inria's strategic objective of interacting with real and virtual worlds.

The CRISP collaboration has resulted in three publications this year in ACM Transactions on Graphics, two being in the SIGGRAPH proceeding. These publications explore the perception of materials in stylized images [11], the perception of distortions in image-based rendering [18] and vector drawing tools for depicting stylized materials [14]. Ongoing projects include those described in Sec. 5.3.9 and Sec. 5.1.3 .

7.3.2. Informal International Partners

7.3.2.1. France-USA

Participants: Gaurav Chaurasia, Adrien Bousseau, George Drettakis.

Beyond CRISP, we have an ongoing collaboration with Yale University (Holly Rushmeier and Julie Dorsey), on weathering, and we are continuing this collaboration on stone aging.

We also have an ongoing collaboration with Adobe Research (Sylvain Paris) and MIT (Fredo Durand) on parallel image-proccessing languages and global illumination (Fredo Durand).

7.3.2.2. France-Germany

Participant: George Drettakis.

We collaborate with the Max-Planck-Institut, Germany, where P. Vangorp (previously at REVES) is now a PostDoc. We collaborate on perception techniques for rendering see publication [18].

7.3.2.3. France-Canada

Participant: Adrien Bousseau.

We collaborate with K. Singh (University of Toronto) and Alla Scheffer (U. British Columbia, Vancouver), on sketching techniques for designers (see Sec. 5.3.10).

7.3.2.4. France-Greece

Participant: George Drettakis.

As mentioned in Sec. 5.2.3 we are collaborating with the Technical University of Crete on visual attention, in the context. of the Ph.D. of George Koulieris, supervised by Prof. Katerina Mania and the Un. of Cottburg (D. Cunningham).

7.4. International Research Visitors

7.4.1. Visits of International Scientists

7.4.1.1. Visitors

We hosted several researchers this year:

- George Koulieris (Tech. Univ. of Crete), in February.
- Eugene Fiume (Univ. of Toronto), in June.
- Peter Vangorp (MPI Informatik), in June.
- Wendy McKay, Theophanis Tsandilas and Lora Oehlberg (Insitu) in July.
- Floraine Berthouzoz (Berkeley), in April.
- Marty Banks (Berkeley), in September.
- Belen Masia (Zaragoza), in October.
- Pierre-Yves Laffont (Brown), in November.
- Holly Rushmeier (Yale), in November.
- Erik Reinhard (Technicolor), in November.

7.4.1.2. Internships

Participant: Joan Sol Roo.

Subject: Geometry Upsampling for Real-Time Rendering of Refractive Objects

Date: from May 2013 until Aug 2013

Institution: National University of the Center of the Buenos Aires Province (Argentina)

Participant: Arunim Samat.

Subject: Approximate Reflection Computation

Date: from Jul 2013 until Aug 2013

Institution: IIT Delhi (India)

Participant: Kritarth Anand.

Subject: Free-Viewpoint Image Based Rendering from Images With Dynamic Objects

Date: from May 2013 until Jul 2013

Institution: IIT Delhi (India)

SCIPORT Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. ANR

7.1.1.1. ECINADS

Sciport is coordinator of the ANR project ECINADS, with CASTOR team, university Montpellier 2, Institut de Mécanique des Fluides de Toulouse and the Lemma company in Sophia-Antipolis. ECINADS concentrates on scalable parallel solution algorithms for state and adjoint systems in CFD, and on the use of this adjoint for mesh adaptation applied to unsteady turbulent flows. ECINADS ended in november.

7.1.1.2. MAIDESC

Sciport is coordinator of the ANR project MAIDESC, with Gamma team, university Montpellier 2, Cemef-Ecole des Mines, Inria-Bordeaux, Lemma and Transvalor. MAIDESC started in october. MAIDESC concentrates on mesh adaption and in particular meshes for interfaces, third-order accuracy, meshes for boundary layers, and curved meshes.

7.2. European Initiatives

7.2.1. FP7 Projects

7.2.1.1. AboutFlow

Type: PEOPLE

Instrument: Initial Training Network

Duration: November 2012 - October 2016

Coordinator: Jens-Dominik Mueller

Partner: Queen Mary University of London (UK)

Inria contact: Laurent Hascoët

Abstract: The aim of AboutFlow is to develop robust gradient-based optimisation methods using adjoint sensitivities for numerical optimisation of flows. http://aboutflow.sems.qmul.ac.uk/

7.2.1.2. UMRIDA

Type:AAT

Instrument:Aeronautics and Air Transport

Duration: 2013-2016

Coordinator: Charles Hirsch

Partner: Numeca S.A. (Belgium)

Inria contact: Alain Dervieux

Abstract: UMRIDA addresses major research challenges in Uncertainty Quantification and Robust Design: develop new methods that handle large numbers of simultaneous uncertainties and generalized geometrical uncertainties. The turn-around time must be acceptable for industrial readiness. UMRIDA will apply these methods to representative industrial configurations.

7.3. International Initiatives

7.3.1. Inria International Partners

7.3.1.1. SARDINE

Program: Inria International Partner

Title: Sophia-Antipolis ARgonne DIfferentiation INitiativE

Inria principal investigator: Laurent Hascoët

International Partner (Institution - Laboratory - Researcher):

Argonne National Laboratory (USA) - Math and Computer Science - Paul Hovland

Duration: 2012 - 2013

We study theoretical and computer science aspects of Automatic Differentiation (AD) by source transformation. In the context of the adjoint mode of AD, which computes gradients, we focus on the storage-recomputation tradeoffs that are the key to efficiency. We also focus on the correct AD of message-passing communication calls that are found in parallel application. A third goal is the use into Uncertainty Quantification of higher-order derivatives produced through AD. From the point of view of tool development, we aim at building interfaces to bridge between the AD tools of our teams, OpenAD and TAPENADE.

7.3.2. Inria International Labs

The team participates in the JLPC, together with our colleagues at Argonne National Laboratory. Laurent Hascoët attended the JLPC meeting in Lyon on june 12-14, and presented our works on the adjoint of MPI-II one-sided communications. The team co-organizes and will host the next JLPC meeting in june 2014 in Sophia-Antipolis.

7.4. International Research Visitors

7.4.1. Visits of International Scientists

- Jean Utke, Argonne National Laboratory (USA), march 11 to march 22.
- Michel Schanen, RWTH Aachen (Germany), march 11 to march 15.
- Trond Steihaug, from University of Bergen (Norway), june 3 to june 28.

7.4.2. Visits to International Teams

- Laurent Hascoët invited by Argonne National Laboratory (USA) from october 14th to october 25th.

STARS Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. Collaborations

- Stars has a strong collaboration with the CobTek team (CHU Nice).
- G. Charpiat works with Yuliya Tarabalka (AYIN team) and with Björn Menze (Computer Vision Laboratory at ETH Zurich, Medical Vision group of CSAIL at MIT, and collaborator of Asclepios team) on the topic of shape growth/shrinkage enforcement for the segmentation of time series.
- G. Charpiat worked with former members from the Ariana team: Ahmed Gamal Eldin (LEAR team), Xavier Descombes (MORPHEME team) and Josiane Zerubia (AYIN team) on the topic of multiple object detection.
- A. Ressouche has a strong collaboration with the Rainbow team (I3S, UNS).

8.2. National Initiatives

8.2.1. ANR

8.2.1.1. MOVEMENT

Program: ANR CSOSG

Project acronym: MOVEMENT

Project title: AutoMatic BiOmetric Verification and PersonnEl Tracking for SeaMless Airport ArEas Security MaNagemenT

Duration: January 2014-June 2017

Coordinator: MORPHO (FR)

Other partners: SAGEM (FR), Inria Sophia-Antipolis (FR), EGIDIUM (FR), EVITECH (FR) and CERAPS (FR)

Abstract: MOVEMENT is focusing on the management of security zones in the non public airport areas. These areas, with a restricted access, are dedicated to service activities such as maintenance, aircraft ground handling, airfreight activities, etc. In these areas, personnel movements tracking and traceability have to be improved in order to facilitate their passage through the different areas, while insuring a high level of security to prevent any unauthorized access. Movement aims at proposing a new concept for the airport's non public security zones (e.g.customs control rooms or luggage loading/unloading areas) management along with the development of an innovative supervision system prototype.

8.2.1.2. SafEE

Program: ANR TESCAN

Project acronym: SafEE

Project title: Safe & Easy Environment for Alzheimer Disease and related disorders

Duration: December 2013-May 2017

Coordinator: CHU Nice

Other partners: Nice Hospital(FR), Nice University (CobTeck FR), Inria Sophia-Antipolis (FR), Aromatherapeutics (FR), SolarGames(FR), Taichung Veterans General Hospital TVGH (TW), NCKU Hospital(TW), SMILE Lab at National Cheng Kung University NCKU (TW), BDE (TW)

Abstract: SafEE project aims at investigating technologies for stimulation and intervention for Alzheimer patients. More precisely, the main goals are: (1)to focus on specific clinical targets in three domains behavior, motricity and cognition (2) to merge assessment and non pharmacological help/intervention and (3) to propose easy ICT device solutions for the end users. In this project, experimental studies will be conducted both in France (at Hospital and Nursery Home) and in Taiwan.

8.2.2. Investment of future

8.2.2.1. Az@GAME

Program: DGCIS

Project acronym: Az@GAME

Project title: un outil d'aide au diagnostic médical sur l'évolution de la maladie d'Alzheimer et les pathologies assimilées.

Duration: January 2012- December 2015

Coordinator: Groupe Genious

Other partners: IDATE (FR), Inria(Stars), CMRR (CHU Nice) and CobTek(Nice University).

See also: http://www.azagame.fr/

Abstract: This French project aims at providing evidence concerning the interest of serious games to design non pharmacological approaches to prevent dementia patients from behavioural disturbances, most particularly for the stimulation of apathy.

8.2.3. Large Scale Inria Initiative

8.2.3.1. PAL

Program: Inria

Project acronym: PAL

Project title: Personally Assisted Living

Duration: 2010 -2014

Coordinator: COPRIN team

Other partners: AROBAS, DEMAR, E-MOTION, STARS, PRIMA, MAIA, TRIO, and LAGADIC Inria teams

See also: http://www-sop.inria.fr/coprin/aen/

Abstract: The objective of this project is to create a research infrastructure that will enable experiments with technologies for improving the quality of life for persons who have suffered a loss of autonomy through age, illness or accident. In particular, the project seeks to enable development of technologies that can provide services for elderly and fragile persons, as well as their immediate family, caregivers and social groups.

8.2.4. Other collaborations

- G. Charpiat works with Yann Ollivier and Jamal Atif (TAO team) as well as Rémi Peyre (École des Mines de Nancy / Institut Élie Cartan) on the topic of image compression.
- G. Charpiat works with Giacomo Nardi, Gabriel Peyré and François-Xavier Vialard (Ceremade, Paris-Dauphine University) on the generalization of gradient flows to non-standard metrics.

8.3. European Initiatives

8.3.1. FP7 Projects

8.3.1.1. CENTAUR

Title: Crowded ENvironments moniToring for Activity Understanding and Recognition

Type: POEPLE

Defi: Computer Vision

Instrument: Industry-Academia Partnerships and Pathway

Duration: January 2013 - December 2016

Coordinator: Honeywell (CZE)

Other partners: Neovison (CZE), Inria Sophia-Antipolis (CZE), Queen Mary University of London (UK) and EPFL in Lausanne (CH).

Inria contact: François Brémond

Abstract:CENTAUR aims at developing a network of scientific excellence addressing research topics in computer vision and advancing the state of the art in video surveillance. The cross fertilization of ideas and technology between academia, research institutions and industry will lay the foundations to new methodologies and commercial solutions for monitoring crowded scenes.Three thrusts identified will enable the monitoring of crowded scenes: a) multi camera, multicoverage tracking of objects of interest, b) Anomaly detection and fusion of multimodal sensors, c) activity recognition and behavior analysis in crowded environments.

8.3.1.2. SUPPORT

Title: Security UPgrade for PORTs

Type: SECURITE

Defi: Port Security

Instrument: Industry-Academia Partnerships and Pathway

Duration: July 2010 - June 2014

Coordinator: BMT Group (UK)

Other partners: Inria Sophia-Antipolis (FR); Swedish Defence Research Agency (SE); Securitas (SE); Technical Research Centre of Finland (FI); MARLO (NO); INLECOM Systems (UK).

Inria contact: François Brémond

Abstract: SUPPORT is addressing potential threats on passenger life and the potential for crippling economic damage arising from intentional unlawful attacks on port facilities, by engaging representative stakeholders to guide the development of next generation solutions for upgraded preventive and remedial security capabilities in European ports. The overall benefit will be the secure and efficient operation of European ports enabling uninterrupted flows of cargos and passengers while suppressing attacks on high value port facilities, illegal immigration and trafficking of drugs, weapons and illicit substances all in line with the efforts of FRONTEX and EU member states.

8.3.1.3. Dem@Care

Title: Dementia Ambient Care: Multi-Sensing Monitoring for Intelligent Remote Management and Decision Support

Type: ICT

Defi: Cognitive Systems and Robotics

Instrument: Industry-Academia Partnerships and Pathway

Duration: November 2011-November 2015

Coordinator: Centre for Research and Technology Hellas (G)

Other partners: Inria Sophia-Antipolis (FR); University of Bordeaux 1(FR); Cassidian (FR), Nice Hospital (FR), LinkCareServices (FR), Lulea Tekniska Universitet (SE); Dublin City University (IE); IBM Israel (IL); Philips (NL); Vistek ISRA Vision (TR).

Inria contact: François Brémond

Abstract: The objective of Dem@Care is the development of a complete system providing personal health services to persons with dementia, as well as medical professionals, by using a multitude of sensors, for context-aware, multiparametric monitoring of lifestyle, ambient environment, and health parameters. Multisensor data analysis, combined with intelligent decision making mechanisms, will allow an accurate representation of the person's current status and will provide the appropriate feedback, both to the person and the associated medical professionals. Multi-parametric monitoring of daily activities, lifestyle, behaviour, in combination with medical data, can provide clinicians with a comprehensive image of the person's condition and its progression, without their being physically present, allowing remote care of their condition.

8.3.1.4. VANAHEIM

Title: Autonomous Monitoring of Underground Transportation Environment

Type: ICT

Defi: Cognitive Systems and Robotics

Instrument: Industry-Academia Partnerships and Pathway

Duration: February 2010 - November 2013

Coordinator: Multitel (Belgium)

Other partners: Inria Sophia-Antipolis (FR); Thales Communications (FR); IDIAP (CH); Torino GTT (Italy); Régie Autonome des Transports Parisiens RATP (France); Ludwig Boltzmann Institute for Urban Ethology (Austria); Thales Communications (Italy).

Inria contact: François Brémond

See also: http://www.vanaheim-project.eu/

Abstract: The aim of this project is to study innovative surveillance components for the autonomous monitoring of multi-Sensory and networked Infrastructure such as underground transportation environment.

8.3.2. Collaborations in European Programs, except FP7

8.3.2.1. PANORAMA

Program: ENIAC

Project acronym: PANORAMA

Project title: Ultra Wide Context Aware Imaging

Duration: April 2012 - March 2015

Coordinator: Philips Healthcare (NL)

Other partners :Medisys (FR), Grass Valley (NL), Bosch Security Systems (NL), STMicroelectronics (FR), Thales Angenieux (FR), CapnaDST (UK), CMOSIS (BE), CycloMedia (Netherlands), Q-Free (Netherlands), TU Eindhoven (NL) , University of Leeds (UK), University of Catania (IT), Inria(France), ARMINES (France), IBBT (Belgium).

See also: http://www.panorama-project.eu/

Inria contact: François Brémond

Abstract: PANORAMA aims to research, develop and demonstrate generic breakthrough technologies and hardware architectures for a broad range of imaging applications. For example, object segmentation is a basic building block of many intermediate and low level image analysis methods. In broadcast applications, segmentation can find people's faces and optimize exposure, noise reduction and color processing for those faces; even more importantly, in a multi-camera set-up these imaging parameters can then be optimized to provide a consistent display of faces (e.g., matching colors) or other regions of interest. PANORAMA will deliver solutions for applications in medical imaging, broadcasting systems and security & surveillance, all of which face similar challenging issues in the real time handling and processing of large volumes of image data. These solutions require the

development of imaging sensors with higher resolutions and new pixel architectures. Furthermore, integrated high performance computing hardware will be needed to allow for the real time image processing and system control. The related ENIAC work program domains and Grand Challenges are Health and Ageing Society - Hospital Healthcare, Communication & Digital Lifestyles - Evolution to a digital lifestyle and Safety & Security - GC Consumers and Citizens security.

8.4. International Initiatives

8.4.1. Inria International Partners

8.4.1.1. Collaborations with Asia

Stars has been cooperating with the Multimedia Research Center in Hanoi MICA on semantics extraction from multimedia data. Stars also collaborates with the National Cheng Kung University in Taiwan and I2R in Singapore.

8.4.1.2. Collaboration with U.S.

Stars collaborates with the University of Southern California.

8.4.1.3. Collaboration with Europe

Stars collaborates with Multitel in Belgium, the University of Kingston upon Thames UK, and the University of Bergen in Norway.

8.4.2. Participation In other International Programs

- EIT ICT Labs is one of the first three Knowledge and Innovation Communities (KICs) selected by the European Institute of Innovation & Technology (EIT) to accelerate innovation in Europe. EIT is a new independent community body set up to address Europe's innovation gap. It aims to rapidly emerge as a key driver of EU's sustainable growth and competitiveness through the stimulation of world-leading innovation. Among the partners, there are strong technical universities (U Berlin, 3TU / NIRICT, Aalto University, UPMC - Université Pierre et Marie Curie, Université Paris-Sud 11, Institut Telecom, The Royal Institute of Technology); excellent research centres (DFKI, Inria, Novay , VTT, SICS) and leading companies (Deutsche Telekom Laboratories, SAP, Siemens, Philips, Nokia, Alcatel-Lucent, France Telecom, Ericsson). This project is largely described at http://eit.ictlabs.eu.

  Stars is involved in the EIT ICT Labs - Health and Wellbeing .

8.5. International Research Visitors

8.5.1. Visits of International Scientists

8.5.1.1. Internships

Narjes Ghrairi

Subject: Primitive Event Generation in an Activity Recognition Platform

Date: from Apr 2013 until Sep 2013

Institution: Ecole Nationale d'Ingénieurs de Tunis (Tunisia)

Mohammed Cherif Bergheul

Subject:Adaptive composition and formal verification of software in ubiquitous computing. Application to ambient health care systems.

Date: from Apr 2013 until Sep 2013

Institution: Ecole Polytech'Nice Cairo (Egypt)

Kartick Subramanian

Subject: People Tracking

Date: from Mar 2013 until Aug 2013

Institution: Nanyang Technological University, Singapore

Augustin Caverzasi

Subject:Trajectory fusion of multi-camera RGB-Depth tracking in partial overlapped scenes.

Date: from Aug 2013 until Dec 2013

Institution: Universidad Nacional de Córdoba, Facultad de Ciencias Exactas Físicas y Naturales, Argentina

Stefanus Candra

Subject: Evaluation of activity recognition system using RGB-Depth camera (e.g. Kinect)

Date: from Aug 2013 until Dec 2013

Institution: University of California, Berkeley CA, Usa

Sahil Dhawan

Subject: Assment of people detection using RGB-Depth sensors (e.g. Kinect), for apathetic patients to improve activity recognition systems.

Date: from Jan 2013 until Jul 2013

Institution: Birla institute of technology and Science, Pilani , India

Marco San Biagio

Subject: People detection using the Brownian descriptor.

Date: from Apr 2013 until Sep 2013

Institution: Italian Inst. of Tech. of Genova

Michal Koperski

Subject: 3D Trajectories for Action Recognition Using Depth Sensors

Date: from Apr 2013 until Dec 2013

Institution: Wroclaw University of Technology

TITANE Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. Grand emprunt

Culture 3D Clouds (started in October 2012) is a national project aimed at devising a cloud computing platform for 3D scanning, documentation, preservation and dissemination of cultural heritage.

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. IRON - Robust Geometry Processing

Type: IDEAS

Instrument: ERC Starting Grant

Duration: January 2011 - December 2015

Coordinator: Pierre Alliez

Inria contact: Pierre Alliez

Abstract: The purpose of this project is to bring forth the full scientific and technological potential of Digital Geometry Processing by consolidating its most foundational aspects. Our methodology will draw from and bridge the two main communities (computer graphics and computational geometry) involved in discrete geometry to derive algorithmic and theoretical contributions that provide both robustness to noisy, unprocessed inputs, and strong guarantees on the outputs. The intended impact is to make the digital geometry pipeline as generic and ironclad as its Digital Signal Processing counterpart.

8.3. International Research Visitors

8.3.1. Visits of International Scientists

Dmitry Anisimov, from University of Lugano, visited us in September-October. We also had short visits of Marcel Campen and Henrik Zimmer from RWTH Aachen.

8.3.1.1. Internships

Anmol Garg from IIT Bombay: Anisotropic metrics for shape approximation.

8.3.2. Visits to International Teams

David Bommes visited the Applied Geometry Lab at California Institute of Technology (Caltech) from May to June.

TOSCA Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR

- N. Champagnat, J. Claisse and D. Villemonais are members of the ANR MANEGE (Modèles Aléatoires eN Écologie, Génétique et Évolution, ending in April 2014) whose aim is to provide methodological and conceptual advances in the study of stochastic processes modeling ecology, population genetics and evolution of life. This work is sustained by regular exchanges with biologists from several teams in France. In addition, the three working groups that operate in each of the three poles of the MANEGE project (Paris, Palaiseau, Marseille) gather all local probabilistic interests in the issues of this project. http://www.cmap.polytechnique.fr/~anr-manege/index_en.html
- A. Lejay is member of the ANR SIMUDMRI (Simulation of diffusion MRI signals in biological tissues) which started in November 2010 (directed by Jing-Rebecca Li, Inria Rocquencourt). http://www.cmap.polytechnique.fr/~jingrebeccali/grants/simudmri.html
- A. Lejay is member of the ANR H2MNO4 (ANR Cosinus, 2012–2015) on Original Optimized Object Oriented Numerical Model for Heterogeneous Hydrogeology which started in November 2012 (directed by Joceyline Erhel, IRISA, Rennes).

8.1.2. Contract with ADEME

Participant: Mireille Bossy.

Modéol Since April 2013, M. Bossy is the coordinator of the MODÉOL collaboration project funded by the French Environment and Energy Agency (ADEME), and involving the IPSL (CNRS) and the French company Maïa Eolis. The overall goal of the project concerns the modeling and prediction of wind potential in France, in particular the quantification of uncertainties and the analysis of multi-scale variability.

Concerning the Inria workpackage, in collaboration with Antoine Rousseau, from the project-team MOISE, M. Bossy introduced the terrain elevation in the SDM modelling. Selim Kraria is starting to work in MODÉOL. This year we also work on the interface of SDM with the classical and widely used numerical weather prediction solver WRF. For the visualisation purpose with the SDM outputs, we also retained the NUM3SIS platform developed at Inria Sophia Antipolis - Méditerranée.

8.2. International Initiatives

8.2.1. Inria Associate Teams

8.2.1.1. ANESTOC

Title: Stochastic modelling of renewable energies

Inria principal investigator: Denis Talay

International Partner (Institution - Laboratory - Researcher):

Pontificia Universidad Católica de Chile (Chile) - ANESTOC - Denis Talay

Duration: 2011 - 2013

See also: http://www.anestoc.cl/es/?page_id=1112

This associate team complements a CIRIC research program in Chile. We refer to the TOSCA-ANESTOC project on stochastic modelling of renewable energies, especially wind farms, and oceanic resources. Our associate team ("équipe associée Inria") will conduct its joint research at two different levels. Firstly, the mathematical work on its own which we have called the "Mathematical Kernel" (MK), motivated by a number of fundamental problems raised by the specific applications in which we are interested. The second level of research concerns two main axes of Applications: (A1) Applications to Engineering (Renewable energies) and (A2) Applications to Neuroscience. The Mathematical Kernel includes a number of fields in the domains of Stochastic Analysis, Statistics and Numerical Analysis. In particular, it is worth mentioning the following: 1. Probabilistic resolution of Boussinesq non-linear partial differential equations; 2. Stochastic Lagrangian modelling for wind simulation at small scale; 3. Open system dynamics as a bridge between Molecular Dynamics and Stochastic Differential Equations; 4. Inference on Stochastic Processes. 5. Algorithms and simulation. The Applications include the stochastic modelling of renewable energy through ocean resources and wind farms (CIRIC-subproject). This subject will be developed with engineers of Fundacion Inria Chile. In addition, applications to ion-channel dynamics through cell membranes will be considered jointly with biophysicists of the CINV (Neuroscience Centre of Valparaíso).

8.2.1.2. Informal International Partners

The TOSCA team project has collaborations with researchers in Japan (Ritsumeikan and Hosei University), Uruguay (Universidad de la República), ...

8.2.2. Inria International Labs

The CIRIC Team on *Stochastic Analysis of Renewable Energies: Ocean Energy and Wind Farms; dynamics and numerics* (2012-2014) is managed by TOSCA and ANESTOC (Univ Catolica, Santiago). It is composed of three main projects.

Mireille Bossy is managing the WINDPOS project, in collaboration with Antoine Rousseau (MOISE team) and three engineers of Inria Chile, Cristian Paris, José Espina Dote and Jacques Morice. Based on the stochastic Lagrangian modeling of the wind at small scale (see SDM SOFTWARE), WINDPOS aims to develop a wind farm simulator software, able to provide fine statistical information for the managing of electricity production.

This year the WINDPOS project focused on the introduction on wind mills modeling in the SDM software. This modeling is based on actuator disk and actuator line models. We also introduced inflow/outflow boundary conditions in SDM and added a CIC averaging in order to refine the input for the projection/pressure computation.

8.2.3. Participation In other International Programs

8.2.3.1. Math Amsud project SIN

Participant: Etienne Tanré.

The Math Amsud project SIN (Stochastic, Inference, Neuroscience) started in 2013. We worked on the part concerned by the stochastic modelling in neuroscience.

It is likely that the stochastic components play an important role in the functions of the neurons and of the networks they form. We describe and study the effect of the noise at different scales of neural activity, such that the level of the ionic channels and the level of neural networks, which are responsible for conveying and processing the information coded in sequences of spikes. The most popular models of this class are integrate and fire (LIF) neural networks. We study the synchronization of neurons in those networks.

8.3. International Research Visitors

8.3.1. Visits of International Scientists

- The TOSCA *seminar* organized by J. Inglis in Sophia Antipolis has received the following speakers: Eric Luçon (Technische Universität, Berlin), Julien Reygner (UPMC), Khaled Bahlali (Université du Sud Toulon-Var), Bertrand Cloez (Laboratoire d'Analyse et de Mathématiques Appliquées Université Paris-Est - Marne-la-Vallée), Michael Mascagni (Florida State University), Camillo Garcia Trillos (Laboratoire J.A. Dieudonné Nice), Pierre Guiraud (CIMFAV Facultad de Ingenieria, Universidad de Valparaíso), Laurent Michel (Laboratoire J.A. Dieudonné Nice), François Delarue (Laboratoire J.A. Dieudonné Nice).
- L. Beznea (Simion Stoilow of the Institute of Mathematics of the Romanina Academy) has been visiting TOSCA Nancy for two weeks in May and June.

8.3.1.1. Internships

Jonathan Alif

Subject: Étude des grandes variations du modèle de Heston

Date: from May 2013 until August 2013

Institution: Université de Lorraine

Maimoun Ben Taher

Subject: Real options for electricity production

Date: from Feb 2013 until May 2013

Institution: École Polytechnique de Tunisie (Tunisia)

Louis Capietto

Subject: Networks with several populations of neurons

Date: January-June 2013

Institution: École Centrale de Lyon

Benoît Henry

Subject: Population genetics and ancestral inference for continuous time branching processes

Date: from March 2013 until September 2013

Institution: Université de Lorraine

Alexis Papic

Subject: First Passage Times

Date: March 2013

Institution: PUC (Chile)

Khaled Salhi

Subject: Risk measures: detection of crisis periods and computation of Value-at-Risk

Date: from March 2013 until September 2013

Institution: Université de Lorraine

Shih Hau Tan

Subject: Towards efficient risk quantification using GPUs and variance reduction techniques

Date: from April 2013 until September 2013, in co-advising with Françoise Baude (OASIS team)

Institution: Erasmus Mundus MathMods Program, University of Nice Sophia-Antipolis

8.3.2. Visits to International Teams

- J. Inglis was invited for one week by B. Zegarlinski to Imperial College London in January.

VIRTUAL PLANTS Project-Team

6. Partnerships and Cooperations

6.1. Regional Initiatives

6.1.1. OpenAlea

Participants: Christophe Pradal, Christophe Godin, Christian Fournier [INRA, LEPSE].

Funding: Agropolis foundation (Contractors for Virtual Plants: CIRAD and Inria from 2009 to 2013)

The aim of this project is to foster the development and the national and international diffusion of the platform OpenAlea. This opensource platform provides an easy-to-use environment for plant modelers through a visual programming interface to efficiently use and combine models or computational methods from different scientific fields in order to represent, analyze and simulate complex plant systems at different scales, from meristems to plant canopy. Work comprises the development of standard data structures, deployment tools, documentation, training, software engineering, user interface, interfaces with other platform, ...

6.1.2. Agropolis computational plant seminar

Participants: Yann Guédon, Thierry Fourcaud [CIRAD, AMAP], Christine Granier [INRA, LEPSE], Soazig Guyomarc'H [Montpellier 2 University, DIADE], Laurent Laplaze [IRD, DIADE].

Funding: Agropolis foundation (Contractor for Virtual Plants: CIRAD. From 2013 to 2016)

In the context of the creation of a world-level pole on plant science in the region Languedoc-Roussillon, we created a monthly seminar on plant modeling and its applications. The seminar is organized by Yann Guédon, Thierry Fourcaud (CIRAD, AMAP), Christine Granier (INRA, LESPE), Soazig Guyomarc'h (Montpellier 2 University, DIADE) and Laurent Laplaze (IRD, DIADE) with the support of Agropolis International and Agropolis Foundation.

6.1.3. Fruit3D

Participants: Mik Cieslak, Frédéric Boudon, Christophe Godin, Nadia Bertin [PSH, Avignon].

Funding: Agropolis foundation (Contractor for Virtual Plants: INRA, from 2009 to 2012)

The project gathers the competences of plant modelers, physicists and ecophysiologists for developing a virtual tomato model. The model contains the geometrical description of a growing fruit, physical and biological laws involved in tissue differentiation and cell growth, physiological models (for sugar and hormone transfers) and mechanical model. Magnetic Resonance Imaging (MRI) techniques are used to provide an in vivo validation of the model by non invasive measurements.

Partners: PSH, INRA, Avignon; LCVN, IES, Université Sud de France, Montpellier.

6.1.4. Rhizopolis

Participants: Frédéric Boudon, Christophe Godin, Yann Guédon, Christophe Pradal.

Funding: Agropolis foundation (Contractor for Virtual Plants: INRA, from 2011 to 2013)

Rhizopolis is a multidisciplinary project on the biology and ecology of the plant root that addresses the broad roles of this organ in mineral nutrient and water acquisition. The consortium adresses central issues such as the coupling of membrane transport activity and structure-function relationships in roots and root symbioses, the integration of root-soil interactions in the rhizosphere at the whole root system level, and the development of key tools for imaging root development. Virtual Plants is mainly involved in the developement of a software for automatically reconstructing root systems from 2D images.

Partners: DAR Team, UMR AGAP, UMR BPMC and UMR LEPSE (Montpellier).

6.1.5. RhizoScanHT

Participants: Julien Diener, Frédéric Boudon, Christophe Godin, Yann Guédon, Christophe Pradal.

Funding: Labex Numev (Contractor for Virtual Plants: UM2, from 2013 to 2014)

In this project, we extend the pipeline of 2D root system reconstruction developed in the project RhizoPolis to deal with high-thoughput data. For this we develop the project in two directions: i) make the pipeline software components more robust to various acquisition conditions and root system complexities ii) use techniques coming from the big data community to upscale the indexing and reconstruction methods.

Partners: Zenith Inria Project Team, UMR AGAP, UMR BPMC and UMR LEPSE (Montpellier).

6.2. National Initiatives

6.2.1. ANR

6.2.1.1. Morpholeaf

Participants: Christophe Godin, Maryam Aliee.

Funding: ANR (Contractor for Virtual Plants: Inria, From 2011 to 2014)

The goal of this project is to apply a systems biology approach combining biological investigation and modeling on leaf margin development to elucidate how gene networks and hormone signalling are translated into specific growth patterns and generate complex shapes. This project brings together three groups that have complementary expertises in biology, image analysis and modeling to provide new insights into the mechanisms of leaf margin development. We will specifically determine the dynamics of CUC/miR164A/auxin activities during leaf development and their interrelations, establish the contributions of cell proliferation and cell expansion to leaf serration and leaf shape and address the contribution of auxin and CUC2 to differential growth and hence to leaf serration and leaf shape.

Partners: RDP ENS-Lyon; INRA Versailles.

6.2.1.2. HydroRoot

Participants: Mikaël Lucas [IRD], Christophe Pradal, Christophe Godin, Christophe Maurel [BPMP].

Funding: ANR (Contractor for Virtual Plants: Cirad, From 2012 to 2014)

The HydroRoot project proposes a unique combination of approaches in the model plant Arabidopsis thaliana to enhance our fundamental knowledge of root water transport. Accurate biophysical measurements and mathematical modeling are used, in support of reverse and quantitative genetics approaches, to produce an integrated view of root hydraulics. The HydroRoot project will address as yet unknown facets of root water transport. It will lead to an integrated view of root hydraulics that considers both tissue hydraulics and root architecture and explains how these components are controlled at the molecular level by physiological and/or environmental cues. Because of its strong physiological and genetic background, this research may also directly impact on breeding programs, for production of crops with optimised water usage and stress responses.

6.2.2. Other national grants

6.2.2.1. OpenAlea 2.0

Participants: Julien Coste, Christophe Pradal, Christophe Godin, Didier Parigot [Inria, Zenith].

Funding: Inria ADT (Contractors for Virtual Plants: Inria from 2012 to 2014)

The goal of this project is to develop an integrated multi-paradigm software environment for plant modeling. This environnement will allow the user to draw, model, program or combine models interactively. In a first step, the component architecture of OpenAlea1 .0 will be extended to dynamically add plugin application. In a second step, we move to a decentralized architecture, capable of distributing simulations in the cloud and share virtual experiments on the web. Finally, the modeling environment to be adapted to run in a web browser using HTML5 and WebGL technology

Partners: EPI Zenith

6.2.2.2. MARS-ALT

Participants: Guillaume Baty, Christophe Pradal, Christophe Godin.

Funding: Inria ADT (Contractors for Virtual Plants: Inria from 2012 to 2014)

The goal of this project is to integrate in a single software platform all the software tools and algorithms that have been developed in various projects about meristem modeling in our teams. More precisely, we aim at building 3D models of meristem development at cellular resolution based on images obtained with confocal or multiphoton microscopy. This set of components will be used by biologists and modelers making it possible to build such meristem structures, to explore and to program them. This platform is embedded in the OpenAlea framework and is based on the imaging components of the platform MedInria.

Partners: EPI Asclepios, RDP ENS-Lyon/INRA, PHIV CIRAD

6.2.2.3. Echap

Participants: Christophe Pradal, Christian Fournier, Corinne Robert [INRA, EGC].

Funding: ONEMA (Contractor for Virtual Plants: INRA, From 2012 to 2014)

The objective of the ECHAP project is to reduce the frequency of treatments and the doses of pesticides applied on crops by taking advantage of natural mechanisms of disease escape related to crop architecture and by optimizing interception of pesticides by plant canopies. It focuses on the development of an integrative, yet modular, modeling tool on the OpenAlea plateform that couples wheat architectural development, the interception and fate of fungicides and the dynamics of a pathogen. Various scenarios combining climate x architecture x fungicide treatment will be simulated to identify and propose efficient strategies of pesticide applications.

Partners: UMR EGC (Paris-Grignon), UMR LEPSE (Montpellier), ARVALIS (Institut du végétal, France), ALTERRA (Research Institute for the Green World, The Nederlands) , ADAS Intitute (UK), CNRS, and IRSTEA .

6.2.2.4. Morphogenetics

Participants: Christophe Godin, Frédéric Boudon, Christophe Pradal, Etienne Farcot, Yann Guédon.

Funding: Inria Project Lab (From 2011 to 2015)

Morphogenetics is an Inria transversal project gathering 3 Inria teams and two Inra teams. It aimed at understanding how flower shape and architecture are controlled by genes during development. Using quantitative live-imaging analysis at cellular resolution we will determine how specific gene functions affect both growth patterns and the expression of other key regulators. The results generated from these experiments will be integrated in a specially designed database (3D Atlas) and used as direct input to new predictive computational models for morphogenesis and gene regulation. Model predictions will then be further tested through subsequent rounds of experimental perturbation and analysis. A particular emphasis will be put on the modeling of mechanics in tissues for which different approaches will be developed.

Partners: ENS-Lyon; Imagine Inria Team (Grenoble); Morpheme Inria Team (Sophia-Antipolis).

6.2.2.5. Rose

Participants: Christophe Godin, Frédéric Boudon, Christophe Pradal.

Funding: INRA - Projet de Pari Scientifique (From 2012 to 2014)

In this project we want to quantify and understand how sugars interfere with hormonal signals (auxin, cytokinins) to regulate lateral bud outgrowth of aerial stems of roses. Experiments will be made on Rose stems to test different levels of sugar conditions and hormonal concentrations on bud outgrowth. An extension of the recently published hormonal model of apical dominance will be made to take into account the role of carbon as a signaling molecule.

Partners: UMR SAGAH, Angers

6.3. European Initiatives

6.3.1. Collaborations in European Programs, except FP7

- **iSAM** (Funding: European EraSybio+ Programme). This project aims at improving our knowledge of shoot apical meristem, and more specifically the combined action of auxin and cytokinin, using a systems biology approach. It is part of a wider program, the ERASysBio initiative, a consortium of European funding bodies, ministries and project management agencies. Four partners are involved in iSAM: the group of J. Murray will focus on mutants of cell cycle regulation, the group of Y. Helariutta is specialized in several aspects of cytokinin regulation, while the group of J. Traas in Lyon provides input regarding auxin regulation and transport, and Virtual Plants is in charge of the modeling aspects, in synergy with the three other groups.

6.4. International Initiatives

6.4.1. Inria International Partners

6.4.1.1. Informal International Partners

There is currently a very active connection with the group of Malcolm Bennett, at the Centre for Plant Integrative Biology (CPIB) in Nottingham, UK. The CPIB invests in the development of OpenAlea at the tissue level. This collaboration is expressed recently through several publication, e.g. [22].

An important collaboration with the Unit Hortsys of CIRAD et the Reunion island and in particular frédéric Normand has been established for a number of year. The topic of the collaboration is the study of the phenology of mango tree. Three members of the team have been visiting our collaborators during the years.

6.5. International Research Visitors

6.5.1. Visits of International Scientists

The team received several visitors from foreign research groups in 2013:

- Farah Ben Naoum, from Sidi Bel Abbes University, Algeria, visited the team last summer for 1 month.
- Katarina Smolenova, from University of Göttingen, Germany, visited the team last fall for 2 weeks.
- Jianming Guo, from Canberra, Australia, visited the team for 5 weeks.
- Xavier Sirault, from Canberra, Australia, visited the team last spring for 2 days.
- John Fozard, from University of Nothingham, visited the team for 2 days.

6.5.1.1. Internships

- Eugenio Espinosa, from Universidad de México (UNAM), visited the team last spring for 6 month.

6.5.2. Visits to International Teams

During the year, frédéric Boudon, Pierre Fernique and Jean Baptiste Durand visited Fred Normand of the UR Hortsys at the CIRAD La Réunion in April and November respectively.

WIMMICS Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. ePSP

Participants: Alain Giboin, Nhan Le Than, Michel Buffa.

Nhan Le Than animates the ePSP interdisciplinary working group at Nice Sophia Antipolis University on the topics of personalized eHealth [15].

8.1.2. HCI Group of Pôle GLC at I3S UNS

Participant: Alain Giboin.

The HCI Group brings together researchers from Pôle GLC teams conducting or wishing to conduct research related to HCI. The group specifically addresses the issues of how to conduct user experiments to evaluate the UIs of the software developed in GLC. The group establishes collaborations between researchers in the design and implementation of experiments. Collaboration took place this year between the teams Rainbow and Wimmics on the assessment of (1) an application composition process driven by the composition of UIs, and (2) the prototype OntoCompo supporting this process.The prototype allows a composition mainly driven by the direct manipulation of UI elements, the other components (task model and software components) being hidden, but still being linked to the UI elements. A user testing of both the process and the prototype has been designed and implemented [70].

8.1.3. Collaboration Agorantic-Inria

Participant: Alain Giboin.

Agorantic is a Federative Structure for Research of the Université d'Avignon et des Pays du Vaucluse, conducting studies on "Culture, heritage and digital societies". Agorantic is interested in how worlds of culture and heritage interact with the Web and digital technology, leading, e.g., to: new forms of knowledge sharing and access to culture, heritage and territories; new forms of writing, mediation and use of cultural events and heritage; new forms of mobility and of territorial representation. Collaboration began this year between ITCS and HSS teams from Agorantic and Inria Sophia Antipolis, including Wimmics, conducting interdisciplinary ITCS-HSS research. This initial collaboration resulted in setting up a proposal of a project for analyzing, designing, and evaluating a system recommending visit tours to museum visitors (individuals and groups).

8.1.4. MSHS : Axe-2 "TIC, Usages et Communautés"

Participants: Alain Giboin, Aurore Defays, Fabien Gandon.

Axis-2 of the Maison des Sciences Humaines et Sociales (MSHS) du Sud-Est (Nice) is interested in the relationships between ICT, Practices and Communities. Axis-2 objective is to make explicit two aspects of the relationship between digital technology and community building: (1) networks and (2) artifacts. Two Axis-2 groups-projects address these aspects: (1) the group-project "Social networks and digital networks" and the group-project "Artifacts and coordination." The first group-project examines how the Internet allows reconstructing the dynamics of interaction networks by making explicit interaction phenomena that could not be observed and treated before the event of Big Data. The second group-project studies the impact of cognitive technologies on the social and cognitive coordination between individuals in organizational and community contexts. Wimmics was involved in the second group-project. In this group, we reported our work on the analysis and modeling of the representations shared by members of a group (also called common ground or common frame of reference).

[15] http://epsp.unice.fr/

8.1.5. MSHS : SyCoViSo project, Systèmes Cognitifs et Formes de Vie Sociale

Participants: Alain Giboin, Elena Cabrio, Fabien Gandon.

SyCoViSo is a project of the MSHS Sud-Est that brings together researchers in HSS and ITCS. Several Inria teams are involved in this project, including Wimmics. SyCoViSo goal is to analyze and model internal and external cognitive processes involved in various forms of social life. SycoViso consisted originally of eight thematic groups; Wimmics was a member of the ”Artifacts, interaction and social networks” group. Following the two SyCoViSo scientific days organized in June 2013, the project was given a second level of organization with three areas having a cross-disciplinary potential: (1) Computational modelling; (2) Classification of artefacts lying beyond the skin; (3) Unconscious factors impacting decision making: emotions, beliefs, morale, etc. Wimmics interest focused in particular on computational modeling of linguistic exchanges occurring in social networks and online communities.

8.2. National Initiatives

8.2.1. ANR Labcom SMILK

SMILK (Social Media Intelligence and Linked Knowledge) is a joint laboratory (Labcom, 2013-2016) between the Wimmics team and the Research and Innovation unit of VISEO (Grenoble). Natural Language Processing, Linked Open Data and Social Networks as well as the links between them are at the core of this LabCom. The purpose of SMILK is both to develop research and technologies in order to retrieve, analyze, and reason on textual data coming from Web sources, and to make use of LOD, social networks structures and interaction in order to improve the analysis and understanding of textual resources. Topics covered by SMILK include: use of data and vocabularies published on the Web in order to search, analyze, disambiguate and structure textual knowledge in a smart way, but also to feed internal information sources; reasoning on the combination of internal and public data and schemes, query and presentation of data and inferences in natural formats.

8.2.2. Ministry of Culture: DBpedia.fr

This project named "DBpedia.fr" proposes the creation of a French chapter of the base DBpedia used in many English applications, in particular for the publication of cultural collections. Because DBpedia is focused on the English version of Wikipedia it ignores some of the French topics and their data. This projects aims at extracting a maximum of RDF data from the French version and providing a stable and scalable end-point for them. We now consider means to improve both the quantity and the quality of the data. The DBpedia.fr project was the first project of the Semanticpedia convention signed by the Ministry of Culture, the Wikimedia foundation and Inria.

Web site: http://wimmics.inria.fr/projects/dbpedia

8.2.3. ANR Datalift

DataLift is an ANR project (2010-2013). Its goal is to design a platform to publish and interlink datasets on the Web of data. Datalift will both publish datasets coming from a network of partners and data providers and propose a set of tools for easing the datasets publication process. DataLift brings raw structured data coming from various formats (relational databases, CSV, XML, ...) to semantic data interlinked on the Web of Data.

Partners: Inria Exmo & Wimmics, LIRMM, Eurecom, Mondeca, Atos, IGN, INSEE, FING

Web site: http://www.datalift.org

8.2.4. ANR Kolflow

Kolflow is an ANR project (2011-2014), it proposes to extend collective intelligence with smart agents relying on automated reasoning. Smart agents can significantly reduce the overhead of communities in the process of continuously building knowledge. Consequently, continuous knowledge building is much more effcient. Kolflow aims at building a social semantic space where humans collaborate with smart agents in order to produce knowledge understandable by humans and machines.

Partners: Inria Orpailleur & Wimmics, Silex U. Claude Bernard Lyon, GDD U. of Nantes

Web site: http://kolflow.univ-nantes.fr

8.2.5. ANR OCKTOPUS

OCKTOPUS is an ANR project (2012-2015). The objective of OCKTOPUS is to increase the potential social and economic benefit of the large and quickly growing amounts of user-generated content, by transforming it into useful knowledge. We believe that it is possible to considerably improve upon existing generic Information Retrieval techniques by exploiting the specific structure of this content and of the online communities which produce it. Specifically, we will focus on a multi-disciplinary approach in order to address the problem of finding relevant answers to questions within forums and question-answer sites. To create metrics and predictors of content quality and use them to improve the search experience of a user, we will take advantage of:

- the experience of the CRG (the management research institute of Ecole Polytechnique and CNRS) to understand better the incentives of, and interactions between individuals who produce online content within large communities;
- the experience of the Wimmics research team to analyze the structural and temporal aspects of the complex typed social graphs found within these communities;
- the ability of Alcméon (a start-up developing a search application dedicated to user-generated content) to integrate and test the results of OCKTOPUS within a common demonstration framework, in order to assess their practical usefulness when applied to concrete large-scale datasets.

Partners: Alcméon, CRG, Inria Wimmics.

Web site: http://ocktopus.alcmeon.com

8.2.6. CNRS Mastodons CrEDIBLE

Participants: Olivier Corby, Catherine Faron Zucker, Alban Gaignard.

We participate to the CrEDIBLE research project funded by the MASTODONS program of the interdisciplinary mission of CNRS which objective is to bring together scientists from all disciplines involved in the implementation of systems sharing of distributed and heterogeneous medical imaging, provide an overview of this area and to evaluate methods of state of the art and technology that affect this area. In this framework, we participated to the organization of a 3-days workshop and we worked with members of the I3S Modalis team on the distribution of algorithms in the Corese/KGRAM engine.

Catherine Faron Zucker was chairman of one of its session and worked with members of the I3S Modalis team on a survey of existing approaches for the translation of relational data to RDF data.

Web site: https://credible.i3s.unice.fr

8.2.7. Inria Large Scale Initiative Action PAL

Participants: Alain Giboin, Célia Ormea.

In collaboration with David Daney (Coprin), Rémy Ramadour (Coprin), Rémi Barraquand (Prima), Marie Babel (Lagadic).

For the second year, Wimmics participated in the large-scale initiative action PAL (Personally Assisted Living) to develop technologies and services to improve the autonomy and quality of life for elderly and frail persons. Wimmics was involved in two main actions: (1) a socio-ergonomic field study to inform the design of a device (such as a robotic shopping trolley) assisting elderly and frail persons to do their shopping autonomously; the results of this study are documented in Célia Ormea Master Thesis; (2) the development and the application of a procedure to collaboratively elaborate a shared scenario to structure the demonstration of the platform integrating the different PAL services.

Web site: http://pal.inria.fr

8.3. International Initiatives

8.3.1. Informal International Partners

Université de Montréal, Canada

HERON (Higher Educational Research ON tutoring systems) Laboratory (Head: Claude Frasson).

Topic of the collaboration: Social exchanges and emotions in mediated polemics – Analysis and data.

Polytechnique Montréal, Canada

Software Engineering Laboratory (Head: Pierre Robillard).

Topic of the collaboration: Modeling of software development processes and teams for quality assessment purposes.

Annaba University, Algeria

The funding of the scientific collaboration project with the LabGed laboratory of university of Annaba (Algeria) by CNRS and DPGRF (Algeria) ended last year but continued in 2013 through the co-supervising of two PhD students from the university of Annaba with our Algerian colleague Hassina Seridi. Samia Beldjoudi works on the personalization of resource recommendation and Khaled Halimi on the personalization and socialization of ubiquitous e-learning systems based on Semantic Web models and techniques.

In 2013 Khaled Halimi visited the team for three months and started writing his thesis during this period. Catherine Faron Zucker received his PhD advisor Hassina Seridi in december with the project of setting a collaboration within the PICS CNRS program in 2014.

8.3.2. Inria International Labs

We participate to the LIRIMA where we have a long term collaboration with University Gaston Berger at Saint-Louis, Senegal. We host two PhD students: Papa Fary Diallo and Oumy Seye.

Catherine Faron Zucker participated to the LIRIMA scientific days in September in Marocco [16].

8.3.3. Participation In other International Programs

Our team is strongly involved in W3C activities:

- Fabien Gandon in the Advisory Committee representative for Inria.
- Olivier Corby participates to SPARQL 1.1 standardization working group.
- Fabien Gandon and Olivier Corby participate to RDF 1.1 standardization working group.
- Serena Villata participates to the LDP (Linked Data Platform) standardization working group.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

Oscar Rodriguez Rocha:

Exploiting the Semantic Web, UGC and Context-Awareness to enhance mobile services for end-users, January 25.

Claude Frasson: *The Emotional Brain*, March 3.

Alberto Barrón Cedeño: *"Uncovering" Good Feedback Instances from an On-line Machine Translation Systems*, April 26.

Luis Ibáñez: *Live Linked Data: making Linked Data writable with massive optimistic replication and Conflict-Free Replicated Data Types*, June 10.

[16] http://www.lirima.uninet.cm/index.php/en

Bernardo Magnini: *The KNOWLEDGE STORE: an Integrated Framework for Ontology Population*, September 6.

Alessio Palmero Aprosio: *Extending Linked Open Data resources exploiting Wikipedia as source of informations*, October 7.

Pierre Robillard, Professor, Department of Computer Engineering, Polytechnique Montréal, Canada.

Stefan Decker, From Networked Knowledge to Insight(s), November 29.

8.4.1.1. Internships

Aurore Defays, PhD student in Ergonomics at the University of Liège, Belgium.

Gessica Puri, PhD student at the Architecture Faculty of Genoa, Italy.

ZENITH Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. Labex NUMEV, Montpellier

URL: http://www.lirmm.fr/numev

We are participating in the Laboratory of Excellence (labex) NUMEV (Digital and Hardware Solutions, Modelling for the Environment and Life Sciences) headed by University of Montpellier 2 in partnership with CNRS, University of Montpellier 1, and Inria. NUMEV seeks to harmonize the approaches of hard sciences and life and environmental sciences in order to pave the way for an emerging interdisciplinary group with an international profile. The NUMEV project is decomposed in four complementary research themes: Modeling, Algorithms and computation, Scientific data (processing, integration, security), Model-Systems and measurements. Patrick Valduriez heads the theme on scientific data.

8.1.2. Institut de Biologie Computationnelle (IBC), Montpellier

URL: http://www.ibc-montpellier.fr

IBC is a 5 year project with a funding of 2Meuros by the MENRT ("Investissements d'Avenir" program) to develop innovative methods and software to integrate and analyze biological data at large scale in health, agronomy and environment. Patrick Valduriez heads the workpackage on integration of biological data and knowledge.

8.2. National Initiatives

8.2.1. ANR

8.2.1.1. OTMedia (2011-2013), 150Keuros

Participants: Alexis Joly, Julien Champ, Pierre Letessier.

The Transmedia Observatory project, launched in November 2010, aims to develop processes, tools and methods to better understand the challenges and changes in the media sphere. Studying and tracking media events on all media (web, press, radio and television) are the two prioritized research areas. OTMedia brings together six partners: Inria (Zenith), AFP (French Press Agency), INA (French National Audiovisual Institute), Paris 3 Sorbonne Nouvelle (researchers in Information Science and Communication), Syllabs (a SME specialized in semantic analysis and automatic creation of text) and the Computer Science Laboratory of Avignon University. Zenith addresses more specifically the research challenges related to the trans-media tracking of visual contents (images and videos) and the clustering of heterogeneous information sources.

8.2.2. PIA

8.2.2.1. Datascale (2013-2015), 250Keuros

Participants: Reza Akbarinia, Florent Masseglia, Saber Salah, Patrick Valduriez.

The Datascale project is a "projet investissements d'avenir" on big data with Bull (leader), CEA, ActiveEon SAS, Armadillo, Twenga, IPGP, Xedix and Inria (Zenith) . The goal of the project is to develop the essential technologies for big data, including efficient data management, software architecture and database architecture, and demonstrate their scalability with representative applications. In this project, the Zenith team works on data mining with Hadoop MapReduce.

8.2.2.2. Xdata (2013-2015), 125Keuros

Participants: Emmanuel Castanier, Patrick Valduriez.

The X-data project is a “projet investissements d’avenir” on big data with Data Publica (leader), Orange, La Poste, EDF, Cinequant, Hurence and Inria (Indes, Planete and Zenith) . The goal of the project is to develop a big data plaftform with various tools and services to integrate open data and partners’s private data for analyzing the location, density and consuming of individuals and organizations in terms of energy and services. In this project, the Zenith team heads the workpackage on data integration.

8.2.3. Others

8.2.3.1. RTRA Pl@ntNet (2009-2013), 1Meuros

Participants: Alexis Joly, Hervé Goëau, Julien Champ, Saloua Litayem, Mathias Chouet.

The Pl@ntNet project http://www.plantnet-project.org/ was launched in 2009 by a large international consortium headed by three groups with complementary skills (UMR AMAP [6], IMEDIA project team at Inria, and the French botanical network TelaBotanica [7]), with financial support from the Agropolis Foundation. Due to the departure of Nozha Boujemaa from the head of IMEDIA and the mobility of Alexis Joly in 2011, Zenith has been entrusted with the Inria’s management and scientific coordination of the project in spring 2012. The objectives of the project are (i) to develop cutting-edge transdisciplinary research at the frontier between integrative botany and computational sciences, based on the use of large datasets and expertise in plant morphology, anatomy, agronomy, taxonomy, ecology, biogeography and practical uses (ii) provide free, easy-access software tools and methods for plant identification and for the aggregation, management, sharing and utilization of plant-related data (iii) promote citizen science as a powerful means to enrich databases with new information on plants and to meet the need for capacity building in agronomy, botany and ecology.

8.2.3.2. CIFRE INA/Inria (2011-2013), 100Keuros

Participants: Alexis Joly, Pierre Letessier.

This CIFRE contract with INA allows funding a 3-years PhD (Pierre Letessier). This PhD addresses research challenges related to content-based mining of visual objects in large collections.

8.2.3.3. CIFRE INA/Inria (2013-2016), 100Keuros

Participants: Alexis Joly, Valentin Leveau, Patrick Valduriez.

This CIFRE contract with INA allows funding a 3-years PhD (Valentin Leveau). This PhD addresses research challenges related to large-scale supervised content-based retrieval notably in distributed environments.

8.2.3.4. CNRS INS2I Mastodons (2013), 30Keuros

Participants: Florent Masseglia, Esther Pacitti [leader], Patrick Valduriez.

This project deals with the problems of big data in the context of life science, where masses of data are being produced, e.g. by Next Generation Sequencing technologies or plant phenotyping platforms. In this project, Zenith addresses the specific problems of large-scale data analysis and data sharing.

8.3. European Initiatives

8.3.1. FP7 Projects

8.3.1.1. CoherentPaaS

Project title: A Coherent and Rich Platform as a Service with a Common Programming Model

Instrument: Integrated Project

Duration: 2013 - 2016

Total funding: 5 Meuros (Zenith: 500Keuros)

Coordinator: U. Madrid, Spain

[6] http://amap.cirad.fr/en/
[7] http://www.tela-botanica.org/

Partner: FORTH (Greece), ICCS (Greece), INESC (Portugal) and the companies MonetDB (Netherlands), QuartetFS (France), Sparsity (Spain), Neurocom (Greece), Portugal Telecom (Portugal).

Inria contact: Patrick Valduriez

Accessing and managing large amounts of data is becoming a major obstacle to developing new cloud applications and services with correct semantics, requiring tremendous programming effort and expertise. CoherentPaaS addresses this issue in the cloud PaaS landscape by developing a PaaS that incorporates a rich and diverse set of cloud data management technologies, including no SQL data stores, such as key-value data stores and graph databases, SQL data stores, such as in-memory and column-oriented databases, hybrid systems, such as SQL engines on top on key-value data stores, and complex event processing data management systems. It uses a common query language to unify the programming models of all systems under a single paradigm and provides holistic coherence across data stores using a scalable, transactional management system. CoherentPaaS will dramatically reduce the effort required to build and the quality of the resulting cloud applications using multiple cloud data management technologies via a single query language, a uniform programming model, and ACID-based global transactional semantics. CoherentPaaS will design and build a working prototype and will validate the proposed technology with real-life use cases. In this project, Zenith is in charge of designing an SQL-like query language to query multiple databases (SQL, NoSQL) in a cloud and implementing a compiler/optimizer and query engine for that language.

8.4. International Initiatives

8.4.1. Inria Associate Teams

8.4.1.1. BIGDATANET

Title: A hybrid P2P/cloud for big data

Inria principal investigator: Patrick Valduriez

International Partner (Institution - Laboratory - Researcher):

University of California at Santa Barbara (United States) - Distributed Systems Lab. - Amr El Abbadi and Divy Agrawal

Duration: 2013 -2015

See also: https://team.inria.fr/zenith/projects/international-projects/bigdatanet/

The main objective of this research and scientific collaboration is to develop a hybrid architecture of a computational platform that leverages the cloud computing and the P2P computing paradigms. The resulting architecture will enable scalable data management and data analysis infrastructures that can be used to host a variety of next-generation applications that benefit from computing, storage, and networking resources that exist not only at the network core (i.e., data-centers) but also at the network edge (i.e., machines at the user level as well as machines available in CDNs – content distribution networks hosted in ISPs).

8.4.2. International Benchmarks

8.4.2.1. ImageCLEF

Title: The CLEF Cross Language Image Retrieval Track

Inria principal investigator: Alexis Joly

International Partners (Institution - Laboratory - Researcher): HES-SO (Switzerland), Yahoo! Research (Spain), IBrandenburg Technical University (Germany), diap Research Institute (Switzerland), University of Alicante (Spain), Universidad Politécnica de Valencia (Spain), UMR AMAP (France)

Duration: 2011 -2013

See also: http://www.imageclef.org

Since its first edition in 2003, ImageCLEF has become one of the key initiatives promoting the benchmark evaluation of algorithms for the cross-language annotation and retrieval of images in various domains, such as public and personal images, to data acquired by mobile robot platforms and botanic collections. Over the years, by providing new data collections and challenging tasks to the community of interest, the ImageCLEF lab has achieved an unique position in the multi lingual image annotation and retrieval research landscape. As an illustration of its impact, the 2013 edition attracted more than 100 registered team world-wide and 42 of them did cross the finish line by submitting runs of their system [30]. Zenith, through the implication of Alexis Joly and Hervé Goëau, is one of the co-organizer of the lab and the initiator of the plant retrieval task since 2011

8.4.3. Inria International Partners

8.4.3.1. Informal International Partners

We have regular scientific relationships with research laboratories in

- North America: Univ. of Waterloo (Tamer Özsu), Mc Gill, Montreal (Bettina Kemme).
- Asia: National Univ. of Singapore (Beng Chin Ooi, Stéphane Bressan), Wonkwang University, Korea (Kwangjin Park)
- Europe: Univ. of Amsterdam (Naser Ayat, Hamideh Afsarmanesh), Univ. of Madrid (Ricardo Jiménez-Periz), UPC Barcelona (Josep Lluis Larriba Pey, Victor Munoz)

8.4.4. Inria International Labs

The Bigdatanet associated team takes part in the Inria@SiliconValley lab.

8.4.5. Participation In other International Programs

We are involved in the following international actions:

- FAPERJ-Inria project SwfP2Pcloud (Data-centric workflow management in hybrid P2P clouds, 2011-2013) with UFRJ (Marta Mattoso, Vanessa Braganholo, Alexandre Lima) and LNCC, Rio de Janeiro (Fabio Porto) to work on large scale scientific workflows in hybrid P2P clouds;
- CNPq-Inria project Hoscar (HPC and data management, 2012-2015) with LNCC (Fabio Porto), UFC, UFRGS (Philippe Navaux), UFRJ (Alvaro Coutinho, Marta Mattoso) to work on data management in high performance computing environments.

8.5. International Research Visitors

8.5.1. Visits of International Scientists

Dennis Shasha (NYU, USA) gave a seminar on “Storing Clocked Programs Inside DNA: A Simplifying Framework for Nanocomputing” in january.

Prof. Marta Mattoso (UFRJ, Rio de Janeiro) gave a seminar in the context of IBC on “Big Data Workflows – how provenance can help” in march and “Algebraic Dataflows for Big Data Analysis” in november.

Aravind Venkatesan (NTNU, Trondheim, Norway) gave a seminar in the context of IBC on “Bringing Semantic Web Technology to the Lab Bench” in october.

Sihem Amer-Yahia (LIG) gave a seminar on “New Perspectives in Social Data Management” in november.

Themis Palpanas (Univ. Trento, Italy) gave a seminar on “Enabling Exploratory Analysis on Very Large Scientific Data” in december.

8.5.2. Visits to International Teams

Reza Akbarinia and Florent Massglia visited UCSB (Prof. Divy Agrawal and Amr El Abbadi) in may. Esther Pacitti and Patrick Valduriez also visited UCSB and Lawrence Berkeley Laboratory, Berkeley (Dr. Arie Shoshani and Deb. Agrawal) in june.