



RESEARCH CENTER

FIELD

Perception, Cognition, Interaction

Activity Report 2012

Section Partnerships and Cooperations

Edition: 2013-04-24

AUDIO, SPEECH, AND LANGUAGE PROCESSING

1. ALPAGE Project-Team	5
2. METISS Project-Team	9
3. PAROLE Project-Team	12
4. SEMAGRAMME Team	14

INTERACTION AND VISUALIZATION

5. ALICE Project-Team	16
6. AVIZ Project-Team	18
7. IMAGINE Team	22
8. IN-SITU Project-Team	27
9. MANAO Team	30
10. MAVERICK Team	32
11. MIMETIC Team	34
12. MINT Project-Team	37
13. POTIOC Team	40
14. REVES Project-Team	42
15. VR4I Team	48

KNOWLEDGE AND DATA REPRESENTATION AND MANAGEMENT

16. AXIS Project-Team	53
17. DAHU Project-Team	63
18. DREAM Project-Team (section vide)	65
19. EXMO Project-Team	66
20. GRAPHIK Project-Team	68
21. MAIA Project-Team	71
22. MOSTRARE Project-Team	75
23. OAK Team	77
24. ORPAILLEUR Project-Team	79
25. SMIS Project-Team	84
26. WAM Project-Team	87
27. WIMMICS Team	89
28. ZENITH Project-Team	92

ROBOTICS

29. COPRIN Project-Team	95
30. E-MOTION Project-Team (section vide)	96
31. FLOWERS Project-Team	97
32. IMARA Project-Team	104
33. LAGADIC Project-Team	110

VISION, PERCEPTION AND MULTIMEDIA UNDERSTANDING

34. AYIN Team	113
35. IMEDIA2 Team	115
36. LEAR Project-Team	117

37. MAGRIT Project-Team	120
38. MORPHEO Team	122
39. PERCEPTION Team	124
40. PRIMA Project-Team	125
41. SIROCCO Project-Team	130
42. STARS Team	132
43. TEXMEX Project-Team	137
44. WILLOW Project-Team	140

ALPAGE Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. LabEx EFL (*Empirical Foundations of Linguistics*) (2011 – 2021)

Participants: Laurence Danlos, Benoît Sagot, Chloé Braud, Marie Candito, Benoît Crabbé, Pascal Denis, Charlotte Roze, Pierre Magistry, Djamé Seddah, Juliette Thuilier, Éric Villemonte de La Clergerie.

Linguistics and related disciplines addressing language have achieved much progress in the last two decades but improved interdisciplinary communication and interaction can significantly boost this positive trend. The LabEx (excellency cluster) EFL (Empirical Foundations of Linguistics), launched in 2011 and headed by Jacqueline Vaissière, opens new perspectives by adopting an integrative approach. It groups together some of the French leading research teams in theoretical and applied linguistics, in computational linguistics, and in psycholinguistics. Through collaborations with prestigious multidisciplinary institutions (CSLI, MIT, Max Planck Institute, SOAS...) the project aims at contributing to the creation of a Paris School of Linguistics, a novel and innovative interdisciplinary site where dialog among the language sciences can be fostered, with a special focus on empirical foundations and experimental methods and a valuable expertise on technology transfer and applications.

Alpage is a very active member of the LabEx EFL together with other linguistic teams we have been increasingly collaborating with: LLF (University Paris 7 & CNRS) for formal linguistics, LIPN (University Paris 13 & CNRS) for NLP, LPNCog (University Paris 5 & CNRS) LSCP (ENS, EHESS & CNRS) for psycholinguistics, MII (University Paris 4 & CNRS) for Iranian and Indian studies. Alpage resources and tools have already proven relevant for research at the junction of all these areas of linguistics, thus drawing a preview of what the LabEx is about: experimental linguistics (see Section 4.6). Moreover, the LabEx should provide Alpage with opportunities for collaborating with new teams, e.g., on language resource development with descriptive linguists (INALCO, for example).

Benoît Sagot is in charge of one of the 7 scientific “strands” of the LabEx EFL, namely the strand on Language Resources. Several other project members are in charge of research operations within 3 of these 7 strands (“Experimental grammar from a cross-linguistic perspective”, “Computational semantic analysis”, “Language Resources”).

8.2. National Initiatives

8.2.1. ANR

8.2.1.1. ANR project ASFALDA (2012 – 2015)

Participants: Marie Candito, Benoît Sagot, Éric Villemonte de La Clergerie, Laurence Danlos, Marianne Djemaa.

Alpage is principal investigator team for the ANR project ASFALDA, lead by Marie Candito. The other partners are the Laboratoire d’Informatique Fondamentale de Marseille (LIF), the CEA-List, the MELODI team (IRIT, Toulouse), the Laboratoire de Linguistique Formelle (LLF, Paris Diderot) and the Ant’inno society.

The project aims to provide both a French corpus with semantic annotations and automatic tools for shallow semantic analysis, using machine learning techniques to train analyzers on this corpus. The target semantic annotations are structured following the FrameNet framework [56] and can be characterized roughly as an explicitation of “who does what when and where”, that abstracts away from word order / syntactic variation, and to some of the lexical variation found in natural language.

The project relies on an existing standard for semantic annotation of predicates and roles (FrameNet), and on existing previous effort of linguistic annotation for French (the French Treebank). The original FrameNet project provides a structured set of prototypical situations, called frames, along with a semantic characterization of the participants of these situations (called *roles*). We propose to take advantage of this semantic database, which has proved largely portable across languages, to build a French FrameNet, meaning both a lexicon listing which French lexemes can express which frames, and an annotated corpus in which occurrences of frames and roles played by participants are made explicit. The addition of semantic annotations to the French Treebank, which already contains morphological and syntactic annotations, will boost its usefulness both for linguistic studies and for machine-learning-based Natural Language Processing applications for French, such as content semantic annotation, text mining or information extraction.

To cope with the intrinsic coverage difficulty of such a project, we adopt a hybrid strategy to obtain both exhaustive annotation for some specific selected concepts (commercial transaction, communication, causality, sentiment and emotion, time), and exhaustive annotation for some highly frequent verbs. Pre-annotation of roles will be tested, using linking information between deep grammatical functions and semantic roles.

The project is structured as follows:

- Task 1 concerns the delimitation of the focused FrameNet substructure, and its coherence verification, in order to make the resulting structure more easily usable for inference and for automatic enrichment (with compatibility with the original model);
- Task 2 concerns all the lexical aspects: which lexemes can express the selected frames, how they map to external resources, and how their semantic argument can be syntactically expressed, an information usable for automatic pre-annotation on the corpus;
- Task 3 is devoted to the manual annotation of corpus occurrences (we target 20000 annotated occurrences);
- In Task 4 we will design a semantic analyzer, able to automatically make explicit the semantic annotation (frames and roles) on new sentences, using machine learning on the annotated corpus;
- Task 5 consists in testing the integration of the semantic analysis in an industrial search engine, and to measure its usefulness in terms of user satisfaction.

The scientific key aspects of the project are:

- an emphasis on the diversity of ways to express the same frame, including expression (such as discourse connectors) that cross sentence boundaries;
- an emphasis on semi-supervised techniques for semantic analysis, to generalize over the available annotated data.

8.2.1.2. ANR project EDyLex (2010 – 2013)

Participants: Benoît Sagot [principal investigator], Rosa Stern, Damien Nouvel, Virginie Mouilleron, Marion Baranes, Marion Richard, Sarah Beniamine, Laurence Danlos.

EDYLEX is an ANR project (STIC/CONTINT) headed by Benoît Sagot. The focus of the project is the dynamic acquisition of new entries in existing lexical resources that are used in syntactic and semantic parsing systems: how to detect and qualify an unknown word or a new named entity in a text? How to associate it with phonetic, morphosyntactic, syntactic, semantic properties and information? Various complementary techniques will be explored and crossed (probabilistic and symbolic, corpus-based and rule-based...). Their application to the contents produced by the AFP news agency (Agence France-Presse) constitutes a context that is representative for the problems of incompleteness and lexical creativity: indexing, creation and maintenance of ontologies (location and person names, topics), both necessary for handling and organizing a massive information flow (over 4,000 news wires per day).

The participants of the project, besides Alpage, are the LIF (Université de Méditerranée), the LIMSI (CNRS team), two small companies, Syllabs and Vecsys Research, and the AFP.

In 2012, several important developments have been achieved:

- Large-scale improvements within the WOLF (Free French WordNet)
- Corpus-based studies targeted at qualitatively understanding and quantitatively modeling French morphological construction mechanisms (derivation, composition, borrowing and others)
- Development of modules for automatic detection, classification and morphological analysis of unknown words in French corpora [45];
- Adaptation and extension of the NewsProcess architecture, previously developed at Alpage, for meeting the expectations of the EDyLex project in terms of lexicon extension from dynamic corpora, here AFP news wires.

8.2.1.3. ANR project Polymnie (2012-2015)

Participants: Laurence Danlos, Éric Villemonte de la Clergerie.

Polymnie is an ANR research project headed by Sylvain Podogolla (Sémagramme Inria Lorraine) with Melodi (INRIT, CNRS), Signes (LABRI, CNRS) and Alpage as partners. This project relies on the grammatical framework of Abstract Categorical Grammars (ACG). A feature of this formalism is to provide the same mathematical perspective both on the surface forms and on the more abstract forms the latter correspond to. As a consequence:

- ACG allows for the encoding of a large variety of grammatical formalisms such as context-free grammars, Tree Adjoining grammars (TAG), etc.
- ACG define two languages: an abstract language for the abstract forms, and an object language for the surface forms.

The role of Alpage in this project is to develop sentential or discursive grammars written in TAG so as to study their conversion in ACG.

8.2.1.4. “Investissements d’Avenir” project PACTE (2012 – 2014)

Participants: Benoît Sagot, Éric Villemonte de La Clergerie, Laurence Danlos.

PACTE (*Projet d’Amélioration de la Capture TExtuelle*) is an “Investissements d’Avenir” project submitted within the call “Technologies de numérisation et de valorisation des contenus culturels, scientifiques et éducatifs”. It started in early 2012.

PACTE aims at improving the performance of textual capture processes (OCR, manual script recognition, manual capture, direct typing), using NLP tools relying on both statistical (n -gram-based, with scalability issues) and hybrid techniques (involving lexical knowledge and POS-tagging models). It addresses specifically the application domain of written heritage. The project takes place in a multilingual context, and therefore aims at developing as language-independent techniques as possible.

PACTE involves 3 companies (DIADEIS, main partner, as well as A2IA and Isako) as well as Alpage and the LIUM (University of Le Mans). It brings together business specialists, large-scale corpora, lexical resources, as well as the scientific and technical expertise required.

In 2012, the results obtained within PACTE are mostly related to SxPipe and to DeLex, the new Alexina lexicon for German (as well as the German instance of MELt trained among other on DeLex). These results are described in more details in the corresponding “software” sections.

8.3. International Initiatives

8.3.1. Participation In International Programs

8.3.1.1. ISO subcommittee TC37 SC4 on “Language Resources Management”

Participant: Éric Villemonte de La Clergerie.

The participation of ALPAGE to French Technolanguage action Normalanguage has resulted in a strong implication in ISO subcommittee TC37 SC4 on “Language Resources Management” Éric de La Clergerie has participated to an ISO meeting in Madrid (June 2012) and has played a role of expert (in particular on morpho-syntactic annotations [MAF], feature structures [FSR & new FSD], and syntactic annotations [SynAF]). MAF has finally reached the level of an ISO standard (ISO/FDIS 24611, oct. 2012). A paper [21] promoting both SynAF and MAF was presented at TLT’11 (Lisbon, Dec. 2012).

8.4. International Research Visitors

8.4.1. Visits of International Scientists

Roser Sauri, research scientist at Media-Lab in Barcelona (Spain), has been “professeur invitée” at Alpage between the 1st of april and the 15th of May 2012. Roser Sauri is well known for her work on event factuality for which she developed a formal model and an annotated corpus. During her stay in Paris, she has been working with Alpage members to extend her model to discourse. Moreover, she helped Alpage in launching the FDTB (French Discourse Tree Bank), a project to annotate the French Tree Bank for discourse. Her experience in annotating similar copora for Catalan and Spanish was very fruitful and collaboration with her is going on.

8.4.1.1. Internships

Thomas Roberts (from Jun 2012 until Aug 2012)

Subject: Lefff-like English syntactic lexicon

Institution: Massachusetts Institute of Technology (United States)

METISS Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. National Projects

8.1.1.1. QUAERO CTC and Corpus Projects (OSEO)

Participants: Kamil Adiloglu, Frédéric Bimbot, Laurence Catanese, Gabriel Sargent, Emmanuel Vincent.

Main academic partners : IRCAM, IRIT, LIMSI, Telecom ParisTech

Quaero is a European research and development program with the goal of developing multimedia and multilingual indexing and management tools for professional and general public applications (such as search engines).

This program is supported by OSEO. The consortium is led by Thomson. Other companies involved in the consortium are: France Télécom, Exalead, Bertin Technologies, Jouve, Grass Valley GmbH, Vecsys, LTU Technologies, Siemens A.G. and Synapse Développement. Many public research institutes are also involved, including LIMSI-CNRS, Inria, IRCAM, RWTH Aachen, University of Karlsruhe, IRIT, Clips/Imag, Telecom ParisTech, INRA, as well as other public organisations such as INA, BNF, LIPN and DGA.

METISS is involved in two technological domains : audio processing and music information retrieval (WP6). The research activities (CTC project) are focused on improving audio and music analysis, segmentation and description algorithms in terms of efficiency, robustness and scalability. Some effort is also dedicated on corpus design, collection and annotation (Corpus Project).

METISS also takes part to research and corpus activities in multimodal processing (WP10), in close collaboration with the TEXMEX project-team.

8.1.1.2. ANR ECHANGE

Participants: Rémi Gribonval, Emmanuel Vincent, Nancy Bertin.

Duration: 3 years (started January 2009). Partners: A. Cohen, Laboratoire J. Louis Lions (Paris 6); F. Ollivier et J. Marchal, Laboratoire MPIA / Institut Jean Le Rond d'Alembert (Paris 6); L. Daudet, Laboratoire Ondes et Acoustique (Paris 6/7).

The objective of the ECHANGE project (EChantillonnage Acoustique Nouvelle GÉNération) was to setup a theoretical and computational framework, based on the principles of compressed sensing, for the measurement and processing of complex acoustic fields through a limited number of acoustic sensors.

8.1.1.3. DGCIS REV-TV

Participants: Guylaine Le Jan, Grégoire Bachman, Nathan Souviraà-Labastie, Frédéric Bimbot.

Duration: 2.5 years (2010-2012). Partners: Technicolor (ex Thomson R&D), Artefacto, Bilboquet, Soniris, ISTIA, Télécom Bretagne, Cap Canal

The Rev-TV project aims at developing new concepts, algorithms and systems in the production of contents for interactive television based on mixed-reality.

In this context, the Metiss research group was focused on audio processing for the animation of an avatar (lip movements, facial expressions) and the control of interactive functionalities by voice and vocal commands.

8.1.2. Action de Développement Technologique

8.1.2.1. FASST

Participants: Nancy Bertin, Emmanuel Vincent, Frédéric Bimbot.

Duration: 2 years (2012–2014). Partners: Inria Teams Parole (Nancy) and Texmex (Rennes)

This Inria ADT aims to develop a new version of our FASST audio source separation toolbox in order to facilitate its large-scale dissemination in the source separation community and in the various application communities. A specific effort will be made towards the speech processing community by developing an interface with existing speech recognition software.

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. SMALL

Participants: Rémi Gribonval, Jules Espiau de Lamaestre, Sangnam Nam, Emmanuel Vincent, Nancy Bertin.

Title: Sparse Models, Algorithms and Learning for Large-scale data

Type: COOPERATION (ICT)

Defi: FET Open

Instrument: Specific Targeted Research Project (STREP)

Duration: February 2009 - January 2012

Coordinator: Inria (France)

Others partners: Univ. Edimburg (UK), Queen Mary Univ. (UK), EPFL (CH), Technion Univ. (ISR)

See also: <http://small-project.eu/>

Abstract: The project has developed new foundational theoretical framework for dictionary learning, and scalable algorithms for the training of structured dictionaries.

8.2.1.2. PLEASE

Title: Projections, Learning and Sparsity for Efficient data processing.

Type: IDEAS ()

Instrument: ERC Starting Grant (Starting)

Duration: January 2012 - December 2016

Coordinator: Inria (France)

Principal investigator: Rémi Gribonval

Abstract: The Please ERC is focused on the extension of the sparse representation paradigm towards that of “sparse modeling”, with the challenge of establishing, strengthening and clarifying connections between sparse representations and machine learning

8.2.2. Collaborations in other European Programs

Program: Eureka - Eurostars

Project acronym: i3DMusic

Project title: Real-time Interactive 3D Rendering of Musical Recordings

Duration: October 2010 - September 2013

Other partners: Audionamix (FR), Sonic Emotion (CH), École Polytechnique Fédérale de Lausanne (CH)

Abstract: The i3DMusic project (Real-time Interactive 3D Rendering of Musical Recordings) has been setup with the SMEs Audionamix and Sonic Emotion and the academic partner EPFL to provide a system enabling real-time interactive respatialization of mono or stereo music content. This will be achieved through the combination of source separation and 3D audio rendering techniques. Metiss is responsible for the source separation work package, more precisely for designing scalable online source separation algorithms and estimating advanced spatial parameters from the available mixture.

8.3. International Initiatives

8.3.1. Inria Associate Teams

8.3.1.1. VERSAMUS

Participants: Emmanuel Vincent, Nobutaka Ito, Gabriel Sargent, Frédéric Bimbot, Rémi Gribonval.

Title: Integrated probabilistic music representations for versatile music content processing

Inria principal investigator: Emmanuel Vincent

International Partner (Institution - Laboratory - Researcher):

Tokyo University (Japan) - Department of Physics and Computing

Duration: 2010 - 2012

See also: <http://versamus.inria.fr/>

Music plays a major role in everyday use of digital media contents. Companies and users are waiting for smart content creation and distribution functionalities, such as music classification, search by similarity, summarization, chord transcription, remixing and automatic accompaniment. So far, research efforts have focused on the development of specific algorithms and corpora for each functionality based on low-level sound features characterizing sound as a whole. Yet, music generally results from the superposition of heterogeneous sound components (e.g. voices, pitched musical instruments, drums, sound samples) carrying interdependent features at several levels (e.g. music genre, singer identity, melody, lyrics, voice signal). Integrated music representations combining all feature levels would make it possible to address all of the above functionalities with increased accuracy as well as to visualize and interact with the content in a musically relevant manner. The aim of this project was to investigate, design and validate such representations in the framework of Bayesian data analysis, which provides a rigorous way of combining separate feature models in a modular fashion. Tasks addressed in the project have included the design of a versatile model structure, of a library of feature models and of efficient algorithms for parameter inference and model selection.

PAROLE Project-Team

8. Partnerships and Cooperations

8.1. European Initiatives

8.1.1. Collaborations in European Programs, except FP7

8.1.1.1. Allegro

Program: Interreg

Project acronym: Allegro

Project title: Adaptive Language LEarning technology for the Greater Region

Duration: 01/01/2009 to 31/12/2012

Coordinator: Saarland University

Other partners: Supélec Metz and DFK Kaiserslautern

Abstract: Allegro is an Interreg project (in cooperation with the Department of COmputational LINGuistics and Phonetics of the Saarland University and Supélec Metz) which started in April 2010. It is intended to develop software for foreign language learning. Our contribution consists of developing tools to help learners to master the prosody of a foreign language, i.e. the prosody of English by French learners, and then prosody of French by German learners. We started by recording (with the project Intonale) and segmentating of a corpus made up of English sentences uttered by French speakers and we analyzed specific problems encountered by French speakers when speaking English.

In the first part of the project we have investigated the phonetic segmentation of non-native speech and analyzed the precision of the phoneme boundaries as boundaries are critical for making duration-based diagnoses in computer assisted learning of the prosody of a foreign language. The experiments have shown that it is critical to include non-native pronunciation variants in the pronunciation lexicon used for forced alignment. However it is better to avoid introducing unusual variants. The best performance was achieved by introducing variants that were seen at least two times on some development non-native data set. A detailed analysis of the boundary precision was also carried out. It was observed that a good precision was achieved for boundaries between some classes of phonemes (as for example between plosives and vowels, fricatives and vowels, and so on). Hence such information should be taken into account either in choosing the words when designing the exercises, and/or in the diagnosis process.

During this year, a special attention was paid to checking the consistency of the recorded speech signal with the expected text. The goal behind that, is to detect speech utterances that do not match with the expected text because of learner's inattention (not pronouncing the expected words) or acquisition problems (truncation of the speech acquisition - the beginning or the end of the sentence is missing - or background noise troubles). In case of mismatch, no further processing is to be carried on; on the opposite, when the speech utterance matches the expected text, prosodic features will be analyzed in details in order to provide a prosodic diagnosis of the pronunciation and the adequate feedback. In order to detect a possible mismatch, several criteria are computed based on the comparison of the phonetic segmentation resulting from a forced alignment with the phonetic segmentation obtained with a phonetic-loop or with a word-loop grammar; these criteria are then combined by a classifier to decide if the speech utterance and the expected text matches or not (cf. section 6.2.3.2).

The automatic phonetic segmentation has been included in the JSNOORI software (cf. section 5.2), as well as other extensions specific to handling exercises for learning the prosody of a foreign language.

The detection of the fundamental frequency (F0) is a key aspect of tools developed for learning prosody of a foreign language. Errors in F0 detection compromise the diagnosis set about the learner's utterance and the modifications of the prosody as well. Since no method alone can be sufficiently robust we thus investigated the combination of three methods, Yin, the method proposed by de Cheveigné et al., an autocorrelation method and a spectral comb method already developed within JSnoori. The three methods were redeveloped in Matlab and combined with a neural network approach.

8.1.1.2. *Emospeech*

Program: Eurostar

Project acronym: Emospeech

Project title: Interagir naturellement et émotiennellement avec des environnements virtuels

Duration: 01/06/2009 to 01/06/2012

Coordinator: Artefacto

Other partners: Acapela Speech group

Abstract: The Emospeech project is an Eurostar project started on 1st June 2010 in cooperation with SMEs Artefacto (France) and Acapela (Belgium). This project comes within the scope of serious games and virtual worlds. If existing solutions reach a satisfying level of 3D physical immersion, they do not provide satisfactory natural language interactions. The objective is thus to add spoken interactions via automatic speech recognition and speech synthesis. EPI Parole and Talaris take part in this project and the contribution of Parole will be about the interaction between the virtual world, automatic speech recognition and the dialogue management.

With respect to the development of a speech recognition solution, a prototype was developed in the framework of a serious game, in collaboration with the Talaris team. The speech-based prototype, which relies on the Sphinx4 speech recognition engine, has made possible the collection of speech material, that has later been transcribed. Specialized lexicons have been developed by combining the task-specific vocabulary extracted from the documentation of the serious game, from the speech data collected using the prototype, and from the text data collected by the Talaris team using a text-based prototype, with the most frequent words selecting in broadcast news corpus. Acoustic models have also been adapted using collected speech material.

Parallel to this work, a client/server speech recognizer system has been developed. The client was developed to run on an iPad terminal. Its role mainly consists in recording the speech signal, sending it to the server, waiting for the speech recognition answer, and finally displaying the speech recognition results. The server, runs on a PC, and performs the actual speech recognition task.

SEMAGRAMME Team

7. Partnerships and Cooperations

7.1. Regional Initiatives

7.1.1. *SLAM: Schizophrenia and Language, Analysis and Modeling*

Participants: Maxime Amblard [coordinator], Sylvain Pogodalla.

Schizophrenia is well-known among mental illnesses for the strength of the thought disorders it involves, and for their widespread and spectacular manifestations: from deviant social behavior to delusion, not to speak about affective and sensitive distortions. It aims at exploring a specific manifestation, namely disorders in conversational speech. This is an interdisciplinary research, both empirical and theoretical from several domains, namely psychology, philosophy, linguistic and computer science.

Maxime Amblard is coordinating the pre-project which ended at the end of 2012. A new application on this topic is send for a 2013-2015 project to the Maison des Sciences de l'Homme de Lorraine (MSH-Lorraine, USR 3261), with the same leader. While this year work was dedicated to the test protocol definition, the coming years will be devoted to building an open-access corpus of pathological uses of language. Other participants are: Denis Apotheloz (ATILF, Université de Lorraine), Valérie Aucouturier (Centre Léo Apostel, Université Libre de Bruxelles), Katarina Bartkova (ATILF, Université de Lorraine), Fethi Bretel (CHS Le Rouvray, Rouen), Michel Musiol (InterPSY, Université de Lorraine), Manuel Rebuschi (Archives Poincaré, Université de Lorraine).

7.2. National Initiatives

7.2.1. ANR

7.2.1.1. *Polymnie: Parsing and synthesis with abstract categorial grammars. From lexicon to discourse*

Participants: Maxime Amblard, Philippe de Groote, Aleksandre Maskharashvili, Sylvain Pogodalla [coordinator], Sai Qian.

POLYMNIE³ is a research project funded by the French national research agency (ANR). It relies on the grammatical framework of Abstract Categorial Grammars (ACG). A feature of this formalism is to provide the same mathematical perspective both on the surface forms and on the more abstract forms the latter correspond to. As a consequence:

- ACG allows for the encoding of a large variety of grammatical formalisms such as context-free grammars, Tree Adjoining grammars (TAG), etc.
- ACG define two languages: an abstract language for the abstract forms, and an object language for the surface forms.

Importantly, the notions of object language and abstract language are relative to each other. If we can naturally see surface forms as strings for instance and abstract forms as the associated syntactic trees, we can also consider to associate this abstract form to a first order logical formula as surface (object) form. This property is central in our project as it offers a unified approach to text analysis and text generation, in particular considering the underlying algorithms and their complexity.

ACG definition uses type-theory and lambda-calculus. From this point of view, they smoothly integrate formal semantics models issuing from Montague's proposal. Theories that extend to the discourse level such as Discourse Representation Theory (DRT) and Dynamic Predicate Logic (DPL) were not initially formulated using lambda-calculus. But such formulation have been proposed. In particular, a formulation based on continuation semantics allow them to be expressed quite naturally in the ACG architecture. Dynamic effects of discourse, in particular those related to anaphora resolution or rhetorical relation inference, have then to be expressed by lexical semantics or computed from the syntactic rules as studied in the Inria Collaborative Research Project (ARC) CAuLD⁴.

³<http://semagramme.loria.fr/doku.php?id=projects:polymnie>

It has been shown that the discourse structure of texts play a key role in their understanding. This is the case not only for both for human readers but also for automatic processing systems. For instance, it can enhance text transformation systems such as the ones performing automatic summarization.

POLYMNIE focuses on studying and implementing the modeling of sentences and discourses in a compositional paradigm that takes into account their dynamics and their structures, both in parsing and in generation. To that end, we rely on the ACG framework. The kind of processing we are interested in relate to the automatic construction of summaries or to text simplification. This has to be considered in the limits of the modelling of the linguistic processes (as opposed to inferential processes for instance) these tasks involve.

The complexity of the phenomena, of their formal description, and of their interactions, require to set up a testing and development environment for linguistic modelling. It will consist in extending and stabilizing a software implementing the functionalities of the ACG framework. It will provide a tool for experimentation and validation of the approach.

Partners:

- Sémagramme people
- Alpage (Paris 7 university & Inria Paris-Rocquencourt): Laurence Danlos (local coordinator), C. Braud, C. Roze, Éric Villemonte de la Clergerie
- MELODI (IRIT, CNRS): Stergos Afantenos, Nicholas Asher (local coordinator), Juliette Conrath, Philippe Muller
- Signes (LaBRI, CNRS): Jérôme Kirman, Richard Moot, Christian Retoré (local coordinator), Sylvain Salvati, Noémie-Fleur Sandillon-Rezer

7.3. International Initiatives

7.3.1. Participation In International Programs

7.3.1.1. PHC: Partenariats Hubert Curien

The team collaborates with the Utrecht Institutes of Linguistics OTS (Utrecht University) in the framework of a Van Gogh action (Hubert Curien program). This collaborations is concerned with conservative extensions of Montague semantics.

7.4. International Research Visitors

7.4.1. Visits of International Scientists

- Prof. A. Hadj-Salah (Académie Algérienne de la Langue Arabe) visited Philippe de Groote (January, 10).
- Chris Blom and Yoad Winter (University of Utrecht) visited Philippe de Groote (March, 28-30).

7.4.2. Visits to International Teams

- Philippe de Groote and Sylvain Pogodalla visited Prof. Makoto Kanazawa at the National Institute of Informatics (NII, Tokyo, Japan).
- Philippe de Groote was invited speaker at the workshop 'Properties and Optionality in Syntax and Semantics', Utrecht, February, 13-14.
- Philippe de Groote visited Prof. Yoad Winter at the Utrecht Institute of Linguistics (Utrecht University, the Netherlands), May 23-25.

⁴<http://www.loria.fr/~pogodall/cauld/>

ALICE Project-Team

6. Partnerships and Cooperations

6.1. Regional Initiatives

Our collaborative project “Meshing and PDEs” (cooperation with CORIDA team) aims at developing new techniques for discretizing and solving PDEs, by combining the expertise of the CORIDA team in mathematical modeling with the expertise of the ALICE team in geometry processing.

6.2. National Initiatives

Samuel Hornus has a continued cooperation with the Scientific Foundation Fourmentin-Guilbert on the Graphite-LifeExplorer software.

6.2.1. ANR

Sylvain Lefebvre has a continued collaboration with our industrial partners Allegorithmic and the CSTB through the ANR SIMILAR-CITIES.

Dmitry Sokolov is involved in the ANR COSINUS ModItère (ANR-09-COSI-014) which goal is to design a new geometric modeller based on fractal geometry. The aim of this work is to specify and develop a geometric modeler, based on the formalism of iterated function systems with the following objectives: access to a new universe of original, various, aesthetic shapes, modeling of conventional shapes (smooth surfaces, solids) and unconventional shapes (rough surfaces, porous solids) by defining and controlling the relief (surface state) and lacunarity (size and distribution of holes).

Rhaleb Zayer has continued the investigations on the ANR Physigrafix which aim is to bridge the gap between acquisition and modeling in the context of deformable objects.

6.3. European Initiatives

6.3.1. FP7 Projects

6.3.1.1. GoodShape

Title: Numerical Geometric Abstractions: from bits to equations

Type: IDEAS ()

Instrument: ERC Starting Grant (Starting)

Duration: August 2008 - July 2013

Coordinator: Inria (France)

Abstract: GOODSHAPE involves several fundamental aspects of 3D modelling and computer graphics. GOODSHAPE is taking a new approach to the classic, essential problem of sampling, or the digital representation of objects in a computer. This new approach proposes to simultaneously consider the problem of approximating the solution of a partial differential equation and the optimal sampling problem. The proposed approach, based on the theory of numerical optimization, is likely to lead to new algorithms, more efficient than existing methods. Possible applications are envisioned in inverse engineering and oil exploration.

6.3.1.2. ShapeForge

Title: ShapeForge: By-Example Synthesis for Fabrication

Type: IDEAS ()

Instrument: ERC Starting Grant (Starting)

Duration: December 2012 - November 2017

Coordinator: Inria (France)

Abstract: Despite the advances in fabrication technologies such as 3D printing, we still lack the software allowing for anyone to easily manipulate and create useful objects. Not many people possess the required skills and time to create elegant designs that conform to precise technical specifications. 'By-example' shape synthesis methods are promising to address this problem: New shapes are automatically synthesized by assembling parts cutout of examples. The underlying assumption is that if parts are stitched along similar areas, the result will be similar in terms of its low-level representation: Any small spatial neighbourhood in the output matches a neighbourhood in the input. However, these approaches offer little control over the global organization of the synthesized shapes, which is randomized. The ShapeForge challenge is to automatically produce new objects visually similar to a set of examples, while ensuring that the generated objects can enforce a specific purpose, such as supporting weight distributed in space, affording for seating space or allowing for light to go through. This properties are crucial for someone designing furniture, lamps, containers, stairs and many of the common objects surrounding us. The originality of my approach is to cast a new view on the problem of 'by-example' shape synthesis, formulating it as the joint optimization of 'by-example' objectives, semantic descriptions of the content, as well as structural and fabrication objectives. Throughout the project, we will consider the full creation pipeline, from modelling to the actual fabrication of objects on a 3D printer. We will test our results on printed parts, verifying that they can be fabricated and exhibit the requested structural properties in terms of stability and resistance.

6.4. International Initiatives

6.4.1. Participation In International Programs

Sylvain Lefebvre continues his collaborations with Microsoft Research Asia (Xin Tong), the Hong Kong University (Li-Yi Wei), KIT (Carsten Dachsbacher), and started a new collaboration with ETH Zurich (Olga Sorkine). He was invited for seminars within the teams of Carsten Dachsbacher (KIT) and Rüdiger Westerman (TU Munich).

Bruno Lévy continues his collaborations with Hong-Kong University (Wenping Wang).

6.5. International Research Visitors

6.5.1. Visits of International Scientists

During this last year, our team has been visited by Carsten Dachsbacher, Mathäus Chajdas, Li-Yi Wei and Ivo Ihrke (MPII Sarrbruecken).

6.5.1.1. Internships

Samuel Hornus supervised Pulkit Bansal (Indian master student) as an Inria internship, on the modeling of RNA molecules.

AVIZ Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR FITOC: From Individual To Collaborative Visual Analytics

Participants: Petra Isenberg [correspondant], Jean-Daniel Fekete, Pierre Dragicevic, Wesley Willett.

The project addresses fundamental problems of technological infrastructure and the design of data representation and interaction to build a bridge between individual and team work for visual data analysis. In collaboration with the University of Magdeburg we have begun to tackle this challenge through the design of tangible widgets that help to bridge the gap between individual and collaborative information seeking (see 6.1).

8.1.2. ANR EASEA-Cloud

Participants: Evelyne Lutton [correspondant], Waldo Cancino.

The aim of the EASEA-CLOUD project is to exploit the massively parallel resources that are offered by clusters or a grid of modern GPU-equipped machines in order to find solutions to inverse problems whose evaluation function can be intrinsically sequential. Massive parallelization of generic sequential problems can be achieved by evolutionary computation, that can efficiently exploit the parallel evaluation of thousands of potential solutions (a population) for optimization or machine-learning purposes. The project consists in turning the existing EASEA (EASy Specification of Evolutionary Algorithms, <http://lsit.u-strasbg.fr/easea>) research platform into an industrial-grade platform that could be exploited by running in “cloud” mode, on a large grid of computers (ISC-PIF/CREA is the current manager of the French National Grid). The necessary steps are to develop:

- a professional-grade API, development environment and human-computer interface for the existing academic EASEA platform,
- cloud-management tools (in order to launch an experiment on a grid of computers, monitor the experiment and bill the laboratories or companies that will be using EASEA-CLOUD for intensive computation,
- novel visualisation tools, in order to monitor an evolutionary run, potentially launched on several hundred heterogeneous GPU machines.

The consortium is made of three partners: LSIT/UDS (which is developing the EASEA platform), ISC-PIR/CREA (for its experience in grid and cloud computing), AVIZ/Inria (for its experience in visualization tools for evolutionary computation) and two subcontractors: LogXLabs (a software development company in order to create industrial-grade code and interfaces) an BIOEMERGENCE-IMAGIF, the “valorisation” department of CNRS Gif s/Yvette. Valorisation will take place in strong collaboration with UNISTRA VALO, the valorisation structure of Université de Strasbourg.

The project started on October 1st, 2012, for 2 years. AVIZ will develop new visualisation tools adapted to the monitoring of the optimization process.

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. DREAM

Program: FP7

Project acronym: **DREAM**

Project title: Design and development of REAListic food Models with well-characterised micro- and macro-structure and composition

Duration: 2009–2013

Coordinator: INRA - CEPIA department, Monique Axelos

Other partners: Technical Research Centre of Finland, Actilait France, ADRIA Développement France, CNRS, INRA Transfert, Société de Recherche et Développement Alimentaire Bongrain, Campden BRI Magyarország Nonprofit Kft. Hungary, Central Food Research Institute Hungary, Teagasc - Agriculture and Food Development Authority Ireland, Consiglio Nazionale delle Ricerche - Istituto di Scienze delle Produzioni Alimentari Italy, Top Institute Food and Nutrition The Netherlands, Wageningen University (WUR) The Netherlands, University of Ljubljana, Biotechnical Faculty Slovenia, Institute for Food and Agricultural Research and Technology Spain, Campden BRI UK, Institute of Food Research UK, United Biscuits (UK) Limited.

Abstract:

The overall goal of DREAM (Design and development of REAListic food Models with well-characterised micro- and macro-structure and composition) is to develop realistic, physical and mathematical models to be used as standards that can be exploited across all major food categories to facilitate development of common approaches to risk assessment and nutritional quality for food research and industry.

The partnership involves 18 partners from 9 european countries, among which two multinationals. The project is lead by INRA, CEPIA department, and Inria participation is managed by delegation by the ISC-PIF (CNRS-CREA, UMR 7656).

See more at <http://dream.aeuropae.org/>.

The role of AVIZ has been to develop evolutionary techniques adapted to the modeling of agrifood process. In 2012, the work was focussed on the development:

- of robust evolutionary methods to learn the structure of Bayesian Networks when experimental data are rare (in collaboration with Alberto Tonda, Cédric Baudrit and Nathalie Perrot of INRA/GMPA and Pierre-Henri Wuillemin od LIP6/DESIR), applied to cheese making and biscuit baking process,
- of a model of milk gel based on partial differential equations, where numerical parameters were learn by artificial evolution (in collaboration with Julie Fouquier, Sébastien Gaucel Alberto Tonda, and Nathalie Perrot of INRA/GMPA).

8.2.1.2. CENDARI

Program: Infrastructures

Project acronym: **CENDARI**

Project title: Collaborative EuropeaN Digital/Archival Infrastructure

Duration: 01/2012 - 12/2015

Coordinator: Trinity College, Dublin (IE),

Other partners: Freie Universitaet Berlin (DE), Matematicki Institut Sanu u Beogradu (Serbia), University of Birmingham (UK), King's College London (UK), Georg-August-Universitaet Goettingen Stiftung Oeffentlichen Rechts (DE), Narodni Knihovna Ceske Republiky (Czech Republic), Societa Internazionale per lo Studio del Medioevo Latino-S.I.S.M.E.L. Associazione (IT), Fondazione Ezio Franceschini Onlus (IT), Ministerium fur Wissenschaft, Forschung und Kunst Baden-Wuerttemberg (DE), Consortium of European Research Libraries (UK), Koninklijke Bibliotheek (NL), UNIVERSITA DEGLI STUDI DI CASSINO (IT).

Abstract:

The Collaborative European Digital Archive Infrastructure (CENDARI) will provide and facilitate access to existing archives and resources in Europe for the study of medieval and modern European history through the development of an ‘enquiry environment’. This environment will increase access to records of historic importance across the European Research Area, creating a powerful new platform for accessing and investigating historical data in a transnational fashion overcoming the national and institutional data silos that now exist. It will leverage the power of the European infrastructure for Digital Humanities (DARIAH) bringing these technical experts together with leading historians and existing research infrastructures (archives, libraries and individual digital projects) within a programme of technical research informed by cutting edge reflection on the impact of the digital age on scholarly practice.

The enquiry environment that is at the heart of this proposal will create new ways to discover meaning, a methodology not just of scale but of kind. It will create tools and workspaces that allow researchers to engage with large data sets via federated multilingual searches across heterogeneous resources while defining workflows enabling the creation of personalized research environments, shared research and teaching spaces, and annotation trails, amongst other features. This will be facilitated by multilingual authority lists of named entities (people, places, events) that will harness user involvement to add intelligence to the system. Moreover, it will develop new visual paradigms for the exploration of patterns generated by the system, from knowledge transfer and dissemination, to language usage and shifts, to the advancement and diffusion of ideas.

See more at <http://cendari.eu/> and <http://www.aviz.fr/Research/CENDARI>.

8.2.2. Collaborations with Major European Organizations

Fraunhofer Institute, IGD (DE)

We are collaborating on visual analytics, setting up European projects and coordinating European initiatives on the subject.

University of Desden, (DE)

We have been collaborating with Raimund Dachselt on stackable tangible devices for faceted browsing [35], [33].

8.3. International Initiatives

8.3.1. Inria International Partners

AVIZ researchers collaborate with a number of international partners, including:

- Google, Mountain View, USA
- Microsoft Research, Redmond, USA
- Purdue University, USA
- New York University, USA
- University of Toronto, Canada
- University of Calgary, Canada
- University of British Columbia, Canada
- City University London, UK,
- University of Kent, UK
- University of Konstanz, Germany
- University of Magdeburg, Germany
- University of Groningen, the Netherlands
- University of Granada, Spain

8.3.2. Collaboration with Google

AVIZ collaborates with Google on several projects, related to the Google Research Grant (see sec 7.1) and to evaluation methodology in information visualization [20]. Heidi Lam from Google spent 3 months at AVIZ to collaborate more closely.

8.3.3. Collaboration with Microsoft Research

AVIZ collaborates with several researchers from Microsoft Research Redmond, in particular on the topic of new interactions for information visualization [21] and brain connectivity visualization.

8.3.4. Collaboration with New-York University

Jean-Daniel Fekete collaborates with Claudio Silva and Juliana Freire from NYU-Poly on the VisTrails workflow system for visual analytics (<http://www.vistrails.org>). Rémi Rampin, intern from the Univ. Paris-Sud Master in HCI, has spent one month at Orsay and 5 months at NYU-Poly to allow VisTrails to run Java-based applications and Toolkits. Rémi successfully connected the traditional Python-C implementation of VisTrails to the Java virtual machine using the JPype package. Jean-Daniel Fekete is not porting the Obvious Toolkit [53] in this environment to integrate all its components [26].

8.4. International Research Visitors

8.4.1. Visits of International Scientists

- Heidi Lam (Google, USA)
- Nathaly Henry-Riche (Microsoft Research, USA)
- Ronald Rensink (University of British Columbia, Canada)

AVIZ organized hosted the following international visitors for a one-day visit:

- Marian Dörk (University of Calgary, Canada)
- Shengdong Zhao (National University of Singapore)
- Oliver Deussen and Hendrik Strobel (University of Konstanz, Germany)

8.4.1.1. Internships

Basak ALPER (from May 2012 until Sep 2012)

Subject: Visualization of Brain Data Connectivity

Institution: University of California San Diego (United States)

Stefanie Klum (from September 2011 until April 2012)

Subject: Stackable Widgets for Faceted Information Seeking

Institution: University of Magdeburg (Germany)

IMAGINE Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. *BQR Intuitive 06/2011-12/2012*

Participants: Rémi Brouet, Marie-Paule Cani, Jean-Claude Léon.

The Intuitive project is a collaboration between our research group, the conception group of G-scop lab, and the HCI group of LIG lab. The goal is to develop and compare 2D vs 3D interaction for selecting, placing and editing 3D shapes. The project is funded by Grenoble-INP and provides the grant for Rémi Brouet's PhD.

8.1.2. *BQR INP IDEAL (04/2009 - 03/2012)*

Participant: Jean-Claude Léon.

3D models, coming for instance from engineering fields, are often 'idealized', or 'simplified' (topologically speaking), in order to be used for simulation. The goal of this project IDEAL, funded by Grenoble-INP, is to study these models, in particular the most general ones which are called 'non-manifolds' and which are not handled by current software. We collaborate in this project with the University of Genova in Italy (Leila De Floriani).

8.1.3. *BQR INP "Modèles multirésolutions de fissures" (04/2009 - 09/2012)*

Participants: Marie Durand, François Faure.

A project on the simulation of fracture propagation in concrete structures has started, funded by INP Grenoble. The purpose is to develop a mixed, dynamic model of structures, using finite elements everywhere excepted near crack fronts, where a discrete model is applied. This goes beyond the ANR Vulcain project because we want to dynamically switch between finite element and discrete models. Bui Huu Phoc has started a Ph.D. in October, co-tutored by Frederic Dufour and Vincent Richefeu, from the L3S-R CNRS laboratory, and François Faure from EVASION.

8.1.4. *LIMA 2 "Loisirs et Images" (2007 - 2013)*

Participants: Marie-Paule Cani, François Faure, Damien Rohmer.

LIMA 2 (Loisirs et Images) is a Rhône-Alpes project in the ISLE cluster (Informatique, Signal, Logiciel Embarqué) focussed on classification and computer graphics. This project funded the PhD for Lucian Stanculescu with Raphaëlle Chainé (LIRIS) and Marie-Paule Cani. A research seminar is planned in January 2013 in Lyon. Thibaut Weise from EPFL will be invited as an international speaker.

8.1.5. *Scenoptique (12/2012 - 03/2014)*

Participant: Rémi Ronfard.

In October 2011, we started a collaboration with Theatre des Celestins in Lyon on the topic of interactive editing of rehearsals. This research program is funded by the Region Rhone Alpes as part of their CIBLE project, with a budget for a doctoral thesis (Vineet Gandhi) and three large sensor video cameras. Theatre des Celestins is interested in novel tools for capturing, editing and browsing video recordings of their rehearsals, with applications in reviewing and simulating staging decisions. We are interested in building such tools as a direct application and test of our computational model of film editing, and also for building the world's first publicly available video resource on the creative process of theatre rehearsal. Using state-of-the-art video analysis methods, this corpus is expected to be useful in our future work on procedural animation of virtual actors and narrative design. The corpus is also expected to be shared with the LEAR team as a test bed for video-based action recognition.

8.1.6. PERSYVAL

Participant: Rémi Ronfard.

We received a doctoral grant from LABEX PERSYVAL, as part of the research program on authoring augmented reality (AAR) for PhD student Adela Barbelescu. Her thesis is entitled *directing virtual actors by imitation and mutual interaction - technological and cognitive challenges*. Her advisors are Rémi Ronfard and Gérard Bailly (GIPSA-LAB).

8.2. National Initiatives

8.2.1. ANR RepDyn (01/2010-12/2012)

Participants: Marie Durand, François Faure.

We will participate to the ANR RepDyn project, starting at the beginning of 2010, in collaboration with CEA, EDF, Laboratoire de Mécanique des Structures Industrielles Durables (LaMSID), and ONERA. The purpose of this project is to enhance the performance of discrete elements and fluid computations, for the simulation of cracks in nuclear reactors or planes. Our task is to propose GPU implementations of particle models, as well as load balancing strategies in the context of multi-core, multi-GPU hardware. Marie Durand has started a PhD thesis on this task.

8.2.2. ANR ROMMA (01/2010-12/2013)

Participants: François Faure, Jean-Claude Léon, Stefanie Hahmann.

The ANR project ROMMA has been accepted in 2009 and started in January 2010. The partners of this project are academic and industry experts in mechanical engineering, numerical simulation, geometric modeling and computer graphics. There are three academic members in the consortium: the LMT in Cachan, G-SCOP and LJK (EVASION and MGMI teams) in Grenoble. There are four industrial members: EADS, which coordinates the project, SAMTECH, DISTENE and ANTECIM. The aim of the project is to efficiently and robustly model very complex mechanical assemblies. We are working on the interactive computation of contacts between mechanical parts using GPU techniques. We will also investigate the Visualization of data with uncertainty, applied in the context of the project.

8.2.3. ANR SOHUSIM (10/2010-09/2014)

Participants: Ali Hamadi Dicko, François Faure.

Sohusim (Soft Human Simulation) is a ANR Project which started on October 1st 2010. It is done in collaboration between: EVASION (Inria), Fatronik France (TECNALIA), DEMAR (Inria), HPC PROJECT and the CHU de Montpellier.

This project deals with the problem of modeling and simulation of soft interactions between humans and objects. At the moment, there is no software capable of modeling the physical behavior of human soft tissues (muscles, fat, skin) in mechanical interaction with the environment. The existing software such as LifeMod or OpenSim, models muscles as links of variable length and applying a force to an articulated stiff skeleton. The management of soft tissues is not taken into account and does not constitute the main objective of this software.

A first axis of this project aims at the simple modeling and simulation of a passive human manipulated by a mecatronics device with for objective the study and the systems design of patient's manipulation with very low mobility (clinic bed). The second axis concentrates on the detailed modeling and the simulation of the interaction of an active lower limb with objects like orthosis, exoskeleton, clothes or shoes. The objective being there also to obtain a tool for design of devices in permanent contact with the human who allows determining the adequate ergonomics in terms of forms, location, materials, according to the aimed use.

Dicko Ali Hamadi is a Ph.D. student within EVASION team. His works turns around the problems in SOHUSIM project. He is co-tutored Olivier Palombi in IMAGINE.

8.2.4. *FUI Dynam'it (01/2012 - 02/2014)*

Participant: Francois Faure.

2-year contract with two industrial partners: TeamTo (production of animated series for television) and Artefacts Studio (video games). The goal is to adapt some technologies created in SOFA, and especially the frame-based deformable objects [31], [30] to practical animation tools. This contract provides us with the funding of two engineers and one graphical artist during two years.

8.2.5. *ANR CHROME (01/2012 - 08/2015)*

Participant: Rémi Ronfard.

Chrome is a national project funded by the French Research Agency (ANR). The project is coordinated by Julien Pettré, member of MimeTIC. Partners are: Inria-Grenoble IMAGINE team (Remi Ronfard), Golaem SAS (Stephane Donikian), and Archivideo (Francois Gruson). The project has been launched in september 2012. The Chrome project develops new and original techniques to massively populate huge environments. The key idea is to base our approach on the crowd patch paradigm that enables populating environments from sets of pre-computed portions of crowd animation. These portions undergo specific conditions to be assembled into large scenes. The question of visual exploration of these complex scenes is also raised in the project. We develop original camera control techniques to explore the most relevant part of the animations without suffering occlusions due to the constantly moving content. A long-term goal of the project is to enable populating a large digital mockup of the whole France (Territoire 3D, provided by Archivideo). Dedicated efficient human animation techniques are required (Golaem). A strong originality of the project is to address the problem of crowded scene visualisation through the scope of virtual camera control, as task which is coordinated by Imagine team-member Rémi Ronfard.

Three phd students are funded by the project. Kevin Jordao is working on interactive design and animation of digital populations and crowds for very large environments. His advisors are Julien Pettré and Marie-Paule Cani. Quentin Galvanne is working on automatic creation of virtual animation in crowded environments. His advisors are Rémi Ronfard and March Christie (Mimetic team, Inria Bretagne). Julien Pettre. Chen-Kin Lim is working on crowd simulation and rendering of the behaviours of various populations using crowd patches. Her advisors are Rémi Ronfard and March Christie (Mimetic team, Inria Bretagne). Julien Pettre.

8.2.6. *Action3DS (Caisse des dépôts) (10/2011 - 09/2014)*

Participant: Rémi Ronfard.

Action3DS is a national project funded by Caisse des Dépôts, as part of the *Investissements d'avenir* research program entitled *Technologies de numérisation et de valorisation des contenus culturels, scientifiques et éducatifs*.

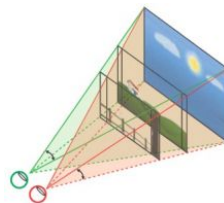


Figure 18. Illustration of the stereoscopic camera system.

The project is coordinated by Thales Angénieux (Patrick Defay). Partners are Inria (Rémi Ronfard), Lutin Userlab (Charles Tijus), LIP6 (Bernadette Bouchon-Meunier), GREYC (David Tschumperlé), École nationale supérieure Louis Lumière (Pascal Martin), Binocle (Yves Pupulin), E2V Semiconductors and Device-Alab.

The goal of the project is the development of a compact professional stereoscopic camera for 3D broadcast and associated software. Rémi Ronfard is leading a work-package on real-time stereoscopic previsualization, gaze-based camera control and stereoscopic image quality.

The project is funding PhD student Inigo Rodriguez who is working on learning-based camera control for stereoscopic 3D cinematography. His advisor is Rémi Ronfard.

8.2.7. AEN MorphoGenetics (10/2012 - 09/2015)

Participant: François Faure.

3-year collaboration with Inria teams Virtual Plants and Demar, as well as INRA (Agricultural research) and the Physics department of ENS Lyon. The goal is to better understand the coupling of genes and mechanical constraints in the morphogenesis (creation of shape) of plants. Our contribution is to create mechanical models of vegetal cells based on microscopy images. This project funds the Ph.D. thesis of Richard Malgat, who started in October, co-advised by François Faure (IMAGINE) and Arezki Boudaoud (ENS Lyon).

8.2.8. PEPS SEMYO (10/2012 - 09/2014)

Participant: François Faure.

2-year collaboration with Inria team DEMAR (Montpellier) and Institut de Myologie (Paris) to simulate 3D models of pathological muscles, for which no standard model exist. The main idea is to use our mesh-less frame-based model to easily create mechanical models based on segmented MRI images.

8.2.9. MSTIC Adamo (03/2012 - 12/2013)

Participant: Olivier Palombi.

8.3. European & International Initiatives

8.3.1. ERC Grant Expressive (04/2012-03/2017)

Participants: Marie-Paule Cani, Stefanie Hahmann, Jean-Claude Léon.

To make expressive and creative design possible in virtual environments, the goal is to totally move away from conventional 3D techniques, where sophisticated interfaces are used to edit the degrees of freedom of pre-existing geometric or physical models: this paradigm has failed, since even trained digital artists still create on traditional media and only use the computer to reproduce already designed content. To allow creative design in virtual environments, from early draft to progressive refinement and finalization of an idea, both interaction tools and models for shape and motion need to be revisited from a user-centred perspective. The challenge is to develop reactive 3D shapes – a new paradigm for high-level, animated 3D content – that will take form, refine, move and deform based on user intent, expressed through intuitive interaction gestures inserted in a user-knowledge context. Anchored in Computer Graphics, this work reaches the frontier of other domains, from Geometry, Conceptual Design and Simulation to Human Computer Interaction.

8.3.2. PhD grant from USM (University Sains Malaysia) (11/2011 - 10/2014)

Seou Ling NG: PhD supervisor: Stéfanie Hahmann: geometric modelling.

8.3.3. PhD grant from USM (University Sains Malaysia) (08/2012 - 07/2015)

Chen Kim Lim: PhD supervisor: Marie-Paule Cani: croud modelling, animation.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

- Nicolas Szilas (University of Geneva): Interactive Storytelling: Models, Architecture and Approach (26/04/2012).
- Karan Singh (University of Toronto): Artist and Perception driven Interactive Graphics (10/05/2012).
- Alla Sheffer (University of British Columbia): Geometry in action (24/05/2012).
- Jarek Rossignac (Georgia Tech): The Beauty of a Motion: Mathematical Definition, Robust Implementation and Applications to Design and Animation (07/06/2012).
- Michael Gleicher (University of Wisconsin-Madison): From Art and Perception to Visualization, Video, and Virtual Reality (12/06/2012).
- Michael Wand (Max-Planck-Institut): Shape Analysis with Correspondences (06/07/2012).
- Ladislav Kavan (ETH Zurich): 3D Virtual Characters: Skinning, Clothing, and Weird Math (12/07/2012).
- Niloy J. Mitra (University of College London): Smart Geometry: In Search of Geometric Simplicity (25/10/2012).
- Mathieu Desbrun (California Institute of Technology): The Power of Duals: from Poisson to Blue Noise (20/12/2012).

IN-SITU Project-Team

7. Partnerships and Cooperations

7.1. Regional Initiatives

DigiPods (2012-2015) – The *Distant Collaborative Interaction Between Heterogeneous Visualization Platforms* project is funded by the “Équipement mi-lourd SESAME 2012” program of the Région Île-de-France. 6 academic partners: FCS Paris-Saclay (coordinator), Université Paris-Sud, Inria, CNRS, CEA, Institut Telecom ParisTech with an overall budget of 1.9 Meuros, including 850 keuros public funding from Région Île-de-France. Stéphane Huot: coordinator and principal investigator for the whole project. The goal is to equip Digiscope platforms (see below) with high-end input and interaction devices/systems. These interaction facilities should be: (i) specific to each kind of platform (e.g., haptic devices for immersive rooms, multitouch devices for high-resolution visualization walls); or (ii) generic for all platforms, in order to allow collaboration between heterogeneous platforms. The latter will be the more innovative, providing users with a personal and configurable interaction space, similar on every platform of the project. Designed for studying distant collaborative interaction, these systems will also serve as a testbed for exploring and addressing the challenges of configurability and adaptability for the end-user.

7.2. National Initiatives

Digiscope - Collaborative Interaction with Complex Data and Computation (2011-2020) <http://digiscope.fr>. “Equipment of Excellence” project funded by the “Investissements d’Avenir” program of the French government. 10 academic partners: FCS Paris-Saclay (coordinator), Université Paris-Sud, CNRS, CEA, Inria, Institut Telecom ParisTech, Ecole Centrale Paris, Université Versailles - Saint-Quentin, ENS Cachan, Maison de la Simulation. Overall budget: 22.5 Meuros, including 6.7 Meuros public funding from ANR. Michel Beaudouin-Lafon: coordinator and principal investigator for the whole project. The goal of the project is to create nine high-end interactive rooms interconnected by high-speed networks and audio-video facilities to study remote collaboration across interactive visualization environments. The equipment will be open to outside users and targets four main application areas: scientific discovery, product lifetime management, decision support for crisis management, and education and training. In Situ will contribute the existing WILD room, a second room called WILDER funded by the project, and its expertise in the design and evaluation of advanced interaction techniques and the development of distributed software architectures for interactive systems.

MDGest - Interacting with Multi-Dimensional Gestures (2011-2014). In Situ is the only academic partner. Funded by the French National Research Agency (ANR), Programme JCJC (Junior researchers): 88 Keuros. Caroline Appert (coordinator) and Theophanis Tsandilas. This project investigates new interactions for small devices equipped with a touchscreen. Complementing the standard point-and-click interaction paradigm, the MDGest project explores an alternative way of interacting with a user interface: tracing gestures with the finger. According to previous work, this form of interaction has several benefits, as it is faster and more natural for certain contexts of use. The originality of the approach lies in considering new gesture characteristics (dimensions) to avoid complex shapes that can be hard for users to memorize and activate. Dimensions of interest include drawing speed (local or global), movement direction, device orientation or inclination, and distinctive drawing patterns in a movement.

DRAO – Adrian Bosseau (Inria, Sophia Antipolis) submitted a successful ANR grant with members from INSITU Fanis Tsandilas (Inria) and Wendy Mackay, and Prof. Maneesh Agrawala (Berkeley), called DRAO, to create interactive graphics tools to support sketching. The kickoff meeting was held in Nov. 2012 and included interviews with designers from Toyota.

7.3. European Initiatives

VCoRE – Visual COmputing Runtime Environment. Inria ADT (Technology Transfer Initiative), two academic partners: Inria (Grenoble, Lille, Rennes, Saclay, Sophia Antipolis) and IGD Fraunhofer Institute (Darmstadt, Germany). Stéphane Huot: coordinator and principal investigator for INSITU / Inria Saclay-Île-de-France, Romain Primet: investigator for INSITU / SED / Inria Saclay-Île-de-France. The VCoRE project aims to share resources and to develop a new software framework for advanced Mixed/Augmented/Virtual Reality and Visualization platforms. The advantages of this shared framework will be (i) to provide engineers and researchers with unified and flexible development tools to support research projects; (ii) to ease the development and porting of applications on heterogeneous immersive and visualization platforms, while still making the most of their capabilities (specific hardware, computing power, interaction devices, etc.). All the partners are conducting research projects on such platforms and have a strong background in computer graphics, human-computer interaction, software engineering, real-time simulation, parallel computing, etc. In VCoRE, INSITU will contribute with its expertise in HCI and software engineering, thanks to the knowledge gained from the WILD project. In concrete terms, several of the software tools and methods for designing and programming interaction developed at INSITU will be improved and integrated into VCoRE as the framework interaction management tools (FlowStates, WILDInputServer).

7.4. International Initiatives

BayScope – Prof. Bjorn Hartman (Berkeley), Michel Beaudouin-Lafon and Wendy Mackay submitted a successful NSF CNIC grant “Architectures and Interaction Paradigms for Multi-surface Environments” to support travel between France and Berkeley in conjunction with the BayScope project, the goal of which is to link our work on DigiScope within France to our partners in the SIRIUS Equipe Associé, in California, specifically at Berkeley and at U.C. San Diego.

7.4.1. Inria Associate Teams

SIRIUS – INSITU has an Equipe Associée called *SIRIUS: Situated Interaction Research at Inria, UCSD and Stanford* with U.C. San Diego and Stanford University. The creation of Inria Silicon Valley, and the move of Prof. Bjoern Hartmann to Berkeley, has meant that we’ve included Berkeley in the research group. The primary area of collaboration has been in the context of our DigiScope project and interaction with wall-sized displays, which led to the creation of BayScope at Berkeley and collaborations on the 75-screen wall at UCSD. We have also collaborated on design process and interactive paper with Stanford.

The SIRIUS Associate Team includes INSITU, (head: W. Mackay), the HCI group at Stanford, (head: Prof. Scott Klemmer), and the DCOG-HCI group at UCSD (head: Prof. Jim Hollan). Arvind Satyanarayan completed his undergraduate degree at UCSD and started a Ph.D. at Stanford in the fall of 2011, with three visits to INSITU in 2012 to work on the Multimedia Interactive Schedule project for CHI’13. Bjorn Hartman completed his Ph.D. at Stanford and joined the UC Berkeley faculty in 2011, and is continuing to collaborate on the HydraScope project. Lora Oehlberg completed her Ph.D. at Berkeley in October, 2011 and began an Inria-Silicon Valley post-doc at INSITU. Daniel Strazzula completed his Masters at Stanford and began a Ph.D. on a CORDI grant at INSITU. Melody Kim, an undergraduate at UCSD, visited INSITU in the fall quarter. Both are working with A. Satyanarayan on the Multimedia Interactive Schedule. W. Mackay worked on Combinatorix [28] with B. Schneider (Stanford Ph.D. student). W. Mackay and F. Tsandilas had several meetings with A. Bosseau as part of the ANR DRAO project, which includes Prof. Maneesh Agrawala from Berkeley). W. Mackay and M. Beaudouin-Lafon visited UCSD (J. Hollan and N. Weibel). W. Mackay, M. Beaudouin-Lafon, A. Satyanarayan and J. Hollan attended the Dagstuhl HCI seminar in Germany. SIRIUS helped sponsor two international workshops, one at Berkeley and one in Orsay, France on interaction in multi-surface environments.

7.4.2. Participation In International Programs

CIRIC Chili – Emmanuel Pietriga joined Inria Chile in July 2012 and is now heading the Massive Data project, continuing the close collaboration with ALMA 6.3 and starting new industrial transfer projects related to the visualization of massive datasets and to the engineering of interactive systems.

7.5. International Research Visitors

7.5.1. Internships

Jéronimo Barbosa, Master student, “Linking digital tabletops with physical paper for creative interactions”, Universidade Federal de Pernambuco (CIn/UFPE), Recife, Brazil. May 2012 - October 2012, Inria International Internships Program. Supervision: Theophanis Tsandilas, Anastasia Bezerianos.

Melody Kim, “Interaction with large displays”, Undergraduate student, University of California, San Diego, USA. UCSD. Supervision: Wendy Mackay.

Arvind Satyanarayan, “Interaction with large displays”, PhD student, Stanford University, Computer Science Dpt. (HCI and Visualization group), Stanford, USA. Sirius associate team. Supervision: Wendy Mackay, Michel Beaudouin-Lafon.

7.5.2. Visits to International Teams

Wendy Mackay and Michel Beaudouin-Lafon completed their two-year sabbatical at Stanford University in June, 2012, where they collaborated closely with the Stanford HCI group (Prof.s S. Klemmer and S. Card) and the Berkeley Institute of Design (BID) (Prof. B. Hartmann). D. Strazzula, who completed his Master’s degree at Stanford, returned to U. Paris on an Inria Cordi Ph.D. grant and L. Oehlberg, who completed her Ph.D. at Berkeley, joined INSITU as a Post-Doctoral Fellow. Julie Wagner (Ph.D., INSITU) and Emilien Ghomi (Ph.D., INSITU), and Stéphane Huot (MC, INSITU) visited W. Mackay and M. Beaudouin-Lafon at Stanford, in April and in May. W. Mackay visited Prof. Marcelo Wanderley at McGill University in Canada.

MANAO Team

6. Partnerships and Cooperations

6.1. Regional Initiatives

6.1.1. CTP materials (2011-2015):

U. Zaragoza, U. Girona

Leader: P. Barla (MANAO)

This collaboration between regions on both French and Spanish sides of Pyrénées aims at studying material properties through their connections between physical and image space. Although the purpose of such a study is general in scope, we also target a particular application: the acquisition of material properties from a single image of an object of unknown shape, under unknown illumination.

6.2. National Initiatives

6.2.1. ANR

6.2.1.1. ALTA (2011-2015):

MAVERICK, REVES

Leader: N. Holzschuch (MAVERICK)

The project ALTA aims at analyzing the light transport equations and at using the resulting representations and algorithms for more efficient computation. We target lighting simulations, either offline, high-quality simulation or interactive simulations.

6.2.1.2. “Young Researcher” IMandM (2011-2015):

IRIT

Leader: L. Barthe (IRIT)

This project aims at the definition of simple and robust tools for the modeling of 3D objects. To this end, the proposed approach consists in combining the nice mathematical properties of implicit surfaces with classical meshes.

6.2.1.3. SeARCH (2009-2013):

PFT3D Archéovision (CNRS), CEALex (USR CNRS 3134), ESTIA

Leader: P. Reuter

Cultural Heritage (CH) artifacts often come as a set of broken fragments leading to difficult 3D puzzles and sometime impossible to solve in a real world. The project’s goal is to propose solutions from on-site acquisition, 3D surface reconstruction and semi-automatic virtual reassembly, taking into account the expertise of CH scientists.

6.2.2. Competitivity Clusters

6.2.2.1. LabEx CPU:

IMB (UPR 5251), LABRI (UMR 5800), Inria (CENTRE BORDEAUX SUD-OUEST), I2M (NEW UMR FROM 2011), IMS (UMR 5218), CEA/DAM

Some members of MANAO participate the local initiative CPU. As it includes many thematics, from fluid mechanics computation to structure safety but also management of timetable, safety of networks and protocols, management of energy consumption, etc., numerical technology can impact a whole industrial sector. In order to address problems in the domain of certification or qualification, we want to develop numerical sciences at such a level that it can be used as a certification tool.

6.3. European Initiatives

6.3.1. FP7 Projects

6.3.1.1. FP7 NoE - V-MusT.net (2011-2015):

partners available at <http://www.v-must.net/participants>

Leader: S. Pescarin (CNR - Italy)

V-MusT.net is a new European Network of Excellence dedicated to Virtual Museums. A Virtual Museum is a personalized, immersive, interactive experience that aims to enhance our understanding of the past in museums or on the Internet. The V-Must.net network enables heritage professionals around the world to connect, collaborate and advance the development and use of virtual museums.

6.3.1.2. FP7 ITN - PRISM “Perceptual Representations for Illumination, Shape and Materials” (2013-2016):

Giessen University, Université Paris-Descartes, Bilkent University, Université de Leuven, Delft University, Birmingham University, Philips and NextLimit

Leader: Roland Fleming (Giessen University)

The goal of this project is to better understand how the human visual system understands images in terms of meaningful components: How is shape perceived consistently in varying illumination conditions and for different materials? To which extent are humans able to guess the main illumination directions in a scene? What visual properties do we make use of to estimate the material an object is made of without touching it? Answering these questions will require inter-disciplinary research and collaborations.

MAVERICK Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. ANR BLANC: ALTA

Participants: Nicolas Holzschuch, Cyril Soler.

We are funded by the ANR research program "Blanc" for a joint research project with two other Inria research teams, REVES in Sophia-Antipolis and iPARLA in Bordeaux. The goal of this project is studying light transport operators for global illumination, both in terms of frequency analysis and dimensional analysis. The grant started in October 2011, for 48 months.

7.1.2. ANR jeune chercheur: SimOne

Participants: Fabrice Neyret, Cyril Soler, Manuel Vennier.

We are funded by the ANR research program "jeune chercheur" (grants for young research leaders, obtained by Eric Bruneton) for a joint research project with the EVASION Inria project-team. The goal of this project is to develop "Scalable Interactive Models Of Nature on Earth" (including shape, motion and illumination models for ocean, clouds, and vegetation). The grant started in December 2010, for 36 months.

7.1.3. ANR CONTINT: RTIGE

Participants: Eric Bruneton, Jean-Dominique Gascuel, Nicolas Holzschuch, Fabrice Neyret.

RTIGE stands for Real-Time and Interactive Galaxy for Edutainment. This is an ANR CONTINT (Contents and Interactions) research program, for a joint research project with the EVASION Inria project-team, the GEPI and LERMA research teams at Paris Observatory, and the RSA Cosmos company. We aim at integrating our results for digital planetariums. The grant started in December 2010, for 48 months.

7.1.4. ANR COSINUS: ROMMA

Participants: Georges-Pierre Bonneau, François Jourdes.

The ANR project ROMMA has been accepted in 2009. It started in January 2010 for a duration of 4 years. The partners of this project are academic and industry experts in mechanical engineering, numerical simulation, geometric modeling and computer graphics. The aim of the project is to efficiently and robustly model very complex mechanical assemblies. We work on the interactive computation of contacts between mechanical parts using GPU techniques. We also investigate the Visualization of data with uncertainty, applied in the context of the project.

7.1.5. ANR CONTINT: MAPSTYLE

Participants: Joëlle Thollot, Hugo Loi.

The MAPSTYLE project aims at exploring the possibilities offered by cartography and expressive rendering to propose original and new cartographic representations. Through this project, we target two types of needs. On the one hand, mapping agencies produce series paper maps with some renderings that are still derived from drawings made by hand 50 years ago: for example, rocky areas in the series TOP25 (to 1/25000) of the French Institut Géographique National (IGN). The rendering of these rocky areas must be automated and its effectiveness retained to meet the requirements of hikers safety. On the other hand, Internet mapping tools allow any user to become a cartographer. However, they provide default styles that cannot be changed (GeoPortal, Google Maps) or they are editable but without any assistance or expertise (CloudMade). In such cases, as in the case of mobile applications, we identify the need to offer users means to design map styles more personalised and more attractive to meet their expectations (decision-making, recreation, etc.) and their tastes. The grant started on October 2012, for 48 months.

7.2. International Initiatives

7.2.1. Participation In International Programs

We had an internship funded by the REUSSI program. Pascal Grosset is PhD student at the university of Utah. He stayed in Maverick from May to July 2012.

7.3. International Research Visitors

7.3.1. Visits of International Scientists

Professor Charles Hansen has started in November 2011 a visit of six month in the Maverick team. His six-months visit is funded by the University of Grenoble. Charles D. Hansen received a BS in computer science from Memphis State University in 1981 and a PhD in computer science from the University of Utah in 1987. He is a professor of computer science at the University of Utah an associate director of the SCI Institute. From 1989 to 1997, he was a Technical Staff Member in the Advanced Computing Laboratory (ACL) located at Los Alamos National Laboratory, where he formed and directed the visualization efforts in the ACL. He was a Bourse de Chateaubriand PostDoc Fellow at Inria, Rocquencourt France, in 1987 and 1988. His research interests include large-scale scientific visualization and computer graphics.

7.3.1.1. Internships

Pascal Grosset visited from May to July 2012, funded by Inria internship (REUSSI). He worked on a psychometric experiment in order to evaluate the benefit of depth of field to improve depth perception in direct volumetric rendering. His work has been accepted for publication at IEEE Pacific Visualization [15].

7.3.2. Visits to International Teams

Eric Heitz is currently visiting the computer graphics group at the university of Montreal, funded by the explorat'oc program from region Rhône-Alpes, from August 2012 to February 2013.

MIMETIC Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. ANR Contint: *iSpace&Time*

Participants: Fabrice Lamarche [contact], Julien Pettré, Marc Christie, Carl Jorgensen.

The iSpace&Time project is founded by the ANR and gathers six partners: IGN, Lamea, University of Rennes 1, LICIT (IFSTAR), Telecom ParisTech and the SENSE laboratory (Orange). The goal of this project is the establishment of a demonstrator of a 4D Geographic Information System of the city on the web. This portal will integrate technologies such as web2.0, sensor networks, immersive visualization, animation and simulation. It will provide solutions ranging from simple 4D city visualization to tools for urban development. Main aspects of this project are:

- Creation of an immersive visualization based on panoramic acquired by a scanning vehicle using hybrid scanning (laser and image).
- Fusion of heterogeneous data issued by a network of sensor enabling to measure flows of pedestrians, vehicles and other mobile objects.
- Use of video cameras to measure, in real time, flows of pedestrians and vehicles.
- Study of the impact of a urban development on mobility by simulating vehicles and pedestrians.
- Integration of temporal information into the information system for visualization, data mining and simulation purpose.
- The mimetic team is involved in the pedestrian simulation part of this project. This project started in 2011 and will end in 2013.

7.1.2. ANR Contint: *Chrome*

Participants: Julien Pettré [julien.pettre@inria.fr], Kevin Jordao, Oriane Siret.

Chrome is a national project funded by the French Research Agency (ANR). The project is leaded by Julien Pettré, member of MimeTIC. Partners are: Inria-Grenoble IMAGINE team (Remi Ronfard), Golaem SAS (Stephane Donikian), and Archivideo (Francois Gruson). The project has been launched in september 2012.

The Chrome project develops new and original techniques to massively populate huge environments. The key idea is to base our approach on the crowd patch paradigm that enables populating environments from sets of pre-computed portions of crowd animation. These portions undergo specific conditions to be assembled into large scenes. The question of visual exploration of these complex scenes is also raised in the project. We develop original camera control techniques to explore the most relevant part of the animations without suffering occlusions due to the constantly moving content. A far term goal of the project is to enable populating a large digital mockup of the whole France (Territoire 3D, provided by Archivideo). Dedicated efficient Human animation techniques are required (Golaem). A strong originality of the project is to address the problem a crowded scene visualisation through the scope of virtual camera control (Inria Rennes and Grenoble)

7.1.3. ANR TecSan: *RePLiCA*

Participant: Armel Crétual [contact].

The goal of RePLiCA project is to build and test a new rehabilitation program for facial praxia in children with cerebral palsy using an interactive device.

In a classical rehabilitation program, the child tries to reproduce the motion of his/her therapist. The feedback he/she has lays on the comparison of different modalities: the gesture of the therapist he/she has seen few seconds ago (visual space) and his/her own motion (proprioceptive space). Unfortunately, besides motor troubles these children often have some cognitive troubles and among them a difficulty to convert the information from a mental space to another one.

The principle of our tool is that during a rehabilitation session the child will observe simultaneously on the same screen an avatar, the virtual therapist's one, performing the gesture to be done, and a second avatar animated from the motion he actually performs. To avoid the use of a too complex motion capture system, the child will be filmed by a simple video camera. One first challenge is thus to be able to capture the child's facial motion with enough accuracy. A second one is to be able to provide him/her an additional feedback upon the gesture quality comparing it to a database of healthy children of the same age.

7.1.4. ANR JCJC: *Cinecitta*

Participants: Marc Christie [marc.christie@irisa.fr], Cunka Sanokho.

Cinecitta is a 3-year young researcher project funded by the French Research Agency (ANR), lead by Marc Christie and that started in October 2012.

The main objective of Cinecitta is to propose and evaluate a novel workflow which mixes user interaction using motion-tracked cameras and automated computation aspects for interactive virtual cinematography that will better support user creativity. We propose a novel cinematographic workflow that features a dynamic collaboration of a creative human filmmaker with an automated virtual camera planner. We expect the process to enhance the filmmaker's creative potential by enabling very rapid exploration of a wide range of viewpoint suggestions. The process has the potential to enhance the quality and utility of the automated planner's suggestions by adapting and reacting to the creative choices made by the filmmaker. This requires three advances in the field. First, the ability to generate relevant viewpoint suggestions following classical cinematic conventions. The formalization of these conventions in a computationally efficient and expressive model is a challenging task in order to select and propose the user with a relevant subset of viewpoints among millions of possibilities. Second, the ability to analyze data from real movies in order to formalize some elements of cinematographic style and genre. Third, the integration of motion-tracked cameras in the workflow. Motion-tracked cameras represent a great potential for cinematographic content creation. However given that tracking spaces are of limited size, there is a need to provide novel interaction metaphors to ease the process of content creation with tracked cameras. Finally we will gather feedback on our prototype by involving professionals (during dedicated workshops) and will perform user evaluations with students from cinema schools.

7.2. European Initiatives

7.2.1. FP7 STREP *Fet-Open Tango*

Participants: Julien Pettré [contact], Jonathan Perrinet, Anne-Hélène Olivier.

The goal of the TANGO project is to take some familiar ideas about affective communication one radical step further by developing a framework to represent and model the essential interactive nature of social communication based on non-verbal communication with facial and bodily expression. Indeed, many everyday actions take place in a social and affective context and presuppose that the agents share this context. But current motion synthesis techniques, e.g. in computer graphics, mainly focus on physical factors. The role of other factors, and specifically psychological variables, is not yet well understood.

In 2012, we focused on interactions between real and virtual humans based on Virtual Reality. During body-based interactions between real and virtual actors, we modulate the emotional expression of the virtual actor. We experimentally observe how the real human react to this modulation.

7.3. International Initiatives

7.3.1. Inria Associate Teams

7.3.1.1. SIMS

Title: Toward realistic and efficient simulation of highly complex systems

Inria principal investigator: Julien Pettré

International Partner (Institution - Laboratory - Researcher):

University of North Carolina at Chapel Hill (United States) - GAMMA Research Group - Ming LIN

Duration: 2012 - 2014

The general goal of SIMS is to make significant progress toward realistic and efficient simulation of highly complex systems which raise combinatory explosive problems. This proposal is focused on human motion and interaction, and covers 3 active topics with wide application range: 1. Crowd simulation: virtual human interacting with other virtual humans, 2. Autonomous virtual humans: who interact with their environment, 3. Physical Simulation: real humans interacting with virtual environments. SIMS is orthogonally structured by transversal questions: the evaluation of the level of realism reached by a simulation (which is a problem by itself in the considered topics), considering complex systems at various scales (micro, meso and macroscopic ones), and facing combinatory explosion of simulation algorithms.

7.3.2. Inria International Partners

- Collaboration with Zhejiang University, State Key Lab CAD&CG, China. Lead by Franck Multon and Julien Pettré (France) and Qunsheng Peng and Weidong Geng (China), following the EA BIRD (ended in 2010). The collaboration mainly involves the co-supervision of a PhD student.
- Collaboration with Queen's University Belfast, UK. Lead by Benoit Bideau and Richard Kulpa (France) and Cathy Craig (UK).

7.4. International Research Visitors

7.4.1. Visits of International Scientists

7.4.1.1. Internships

Hui-Yin WU (from May 2012 until Jul 2012)

Subject: Structured story models for Interactive Storytelling

Institution: National Cheng Chi University (Taiwan)

Funding: Inria Internship

Alexandra COVACI (from Jan 2012 until Jul 2012)

Subject: VR accelerator for learning basketball throws

Institution: University of Brasov (Romania)

Funding: Romanian funding for PhD mobility

7.4.2. Visits to International Teams

- Julien Pettré, Explorateur vist, July 2012, Trinity College Dublin (1 month)
- Edouard Auvinet, joint PhD with University of Montreal, Canada (24 months in Canada on 36 months), Cifre funding
- David Wolinski, (Master student), 3 month visit to Chapel Hill, University of North Carolina, USA

MINT Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

MINT is associated to the CPER (2007-2013), and participates to the PIRVI platform (handled by F. Aubert, co-animated by F. Aubert and D. Marchal), which aims at promoting research achieved by participant research teams (6 research teams, among which MINT), as well as encouraging collaborations with regional economical tissue on the knowledge fields covered within the associated research teams. This dissemination activity has been supported with a regional contract 500 Keuros.

8.2. National Initiatives

8.2.1. *InSTInCT (ANR ContInt, 2009-2012)*

Participants: Géry Casiez [correspondant], Frédéric Giraud, Laurent Grisoni, Nicolas Roussel.

This project focuses on the design, development and evaluation of new simple and efficient touch-based interfaces, with the goal of bringing widespread visibility to new generations of interactive 3D applications.

Partners: Inria [Mint, Iparla], Immersion, Cap Sciences

Web site: <http://anr-instinct.cap-sciences.net/>

8.2.2. *TOUCHIT (13th FUI, 2012-2015)*

Participants: Michel Amberg, Géry Casiez, Frédéric Giraud, Thomas Pietrzak, Nicolas Roussel [correspondant], Betty Lemaire-Semail [correspondant].

The purpose of this project is twofold. It aims at designing and implementing hardware solutions for tactile feedback based on programmable friction. It also aims at developing the knowledge and software tools required to use these new technologies for human-computer interaction. Grant for MINT is balanced on 272 keuro handled at University for L2EP, and 220 Keuros for Inria.

Partners: STMicroelectronics, CEA/LETI, Lille 1 Univ., Inria, Orange Labs, CNRS, EASii IC, MENAPIC and ALPHAUI.

Competitive clusters involved: **Minalogic**, **Cap Digital** and **MAUD**.

8.2.3. *Smart-Store (12th FUI, 2011-2014, extended to 2015)*

Participants: Samuel Degrande [correspondant], Laurent Grisoni, Fabrice Aubert.

The aim of this project is to set up, in the context of retail, some middleware and hardware setup for retail interactive terminal, that allows customer to connect with their own smart-phone on a system that includes a large screen, and allows to browse some store offer, as well as pre-order and/or link to further reconsulting. SME Idées-3com leads this FUI, which also includes Immochan, Oxylane, and VisioNord. Grant for MINT is 301 Keuros. This project start on september 2012 (start of this project has been delayed due to administrative problems), for a duration of 36 months.

associated competitiveness cluster: PICOM (retail)

8.3. European Initiatives

8.3.1. *Sm(art)²*

Participants: Laurent Grisoni [correspondant], Betty Lemaire-Semail, Frédéric Giraud, Géry Casiez.

We submitted in april 2012 the IP proposal Sm(art)² on the call 9, priority 8.2 "ICT for access to cultural ressources". Laurent Grisoni is the scientific coordinator of this proposal. It includes 25 partners, with a global budget of 10 489 Keuros. This proposal ranks 4th on the call among 40 submissions, three proposals are currently in the negotiation phasis. Our proposal is currently ranking first on the additionnal list.

Program: FP7-ICT-2011-9

Project acronym: Sm(art)²

Project title: Smart art: smart tools for personnalised and engaging experiences in cultural heritage

Duration: 48 months

Coordinator: L. Grisoni

Other partners: organisme, labo (pays): Musee du louvres-lens (france), Fraunhoffer (germany), CNRS (france), University Hasselt (belgium), Softkinetic (Belgium), immersion (france), InescID (portugal), France Telecom (france), ...

Abstract: Sm(art)² project is based on the extended model of museum visit concept (pre-, during and post experience) combining physical and online museum and addresses visitors as participants rather than passive consumers. The next generation of museum practitioners will have to think through these challenges carefully, drawing the links more closely between the physical and the virtual so that the museum create more engaging and personalizing experiences and reaches more people meaningfully. The Sm(art)² project aims to implement an interoperable platform with a reusable set of tools and compatible equipment for advanced innovative digital technologies that are able to demonstrate enhanced engaging and personalized experiences of cultural heritage in museums. Moreover the development of economic models for the efficient and legal exploitation of high quality content and technologies will permit the implementation of new services related to the cultural heritage and the use of new technologies.

8.3.2. SHIVA (*InterReg II-Seas, 2010-2014*)

Participants: Fabrice Aubert, Géry Casiez, Samuel Degrande, Laurent Grisoni [correspondant], Damien Marchal, Yosra Rekik, Nicolas Roussel.

Program: Interreg-II seas IV-A

Project acronym: SHIVA

Project title: Sculpture for Haelth-care: Interaction and Virtual Art in 3D

Duration: february 2010-march 2014

Coordinator: L. Grisoni

Other partners: organisme, labo (pays) : University Bournemouht (UK), Victoria education center (Poole, UK), Fondation Hopale (Berck/mer, France)

Abstract: The SHIVA project aims to create a tool that combines virtual reality, advanced geometric modelling, gesture analysis and digital fabrication in a framework for the modelling and physical fabrication of 3-dimensional shapes and objects. The system will be simple to use and disseminate, specifically enabling and improving the quality of life for individuals with impairments, by facilitating and promoting social inclusion and interaction. It will use, provided that patient pathologies allows for it, hands-free interaction, based on currently available hardware systems. Some of the most complex aspects of the system will be transparent to the user or patient. This will enable individuals with or without impairments who use the system to be able to interact with and model 3-dimensional objects that can then be physically manufactured. A set of specific interfaces will also be implemented for children with very low physical abilities (two-states interfaces for example).

Web site: <http://www.lifl.fr/mint/pmwiki.php?n=SHIVA.Php>

8.4. International Research Visitors

8.4.1. Visits of International Scientists

Masaya Takasaki (from March 2012 until July 2012)

Subject: Design of transparent tactile displays

Institution: Saitama University (Japan)

8.4.2. Internships

Yy Yang (from May 2012 until Aug 2012)

Subject: Design and control of large tactile feedback device

Institution: Beihang University of Aeronautics and Astronautics (China)

8.4.3. Visits to International Teams

Frédéric Giraud, Sept 2012–Aug 2013, University of Toronto: Invited professor in the Energy System Group hosted by the department of Electrical and Computer Engineering.

POTIOC Team

7. Partnerships and Cooperations

7.1. Regional Initiatives

- Potioc has strong relationships with Cap Sciences <http://www.cap-sciences.net/>
- Potioc has started a collaboration with La CUB (Communauté Urbaine de Bordeaux). Joint Master thesis on "visualization of strategic data in 3D cities"

7.2. National Initiatives

ANR Project Instinct:

duration: 2009-2012

partners: MINT (Inria Lille), Immersion, Cap Sciences

website: <http://anr-instinct.cap-sciences.net/>

FUI SIMCA 2000:

duration: 2011-2013

partners: Oktal, ENAC (Ecole Nationale de l'Aviation Civile), Toulouse-Blagnac airport, Air France, CGx AERO in SYS

website: <https://team.inria.fr/potioc/fr/collaborative-projects/simca/>

PIA ville numérique "Villes transparentes":

duration: 2012-2014

partners: Pages Jaunes/Mappy, Vectuel/Virtuelcity

Inria ADT OpenViBE-NT:

duration: 2012-2014

partners: Inria teams Hybrid, Neurosys and Athena

website: <http://openvibe.inria.fr>

7.3. European Initiatives

LIRA Stress and Relaxation project:

Program: Inria - Philips - Fraunhofer partnership

Project acronym: LIRA

Project title: Life-style Research Association, Lifestyle Management: Stress and Relaxation

Coordinator: Frederic Alexandre

Other partners: Philips (Netherlands), Fraunhofer (Germany), Inria teams Hybrid and Mimetic

Abstract: The Stress and Relaxation project aims at offering services to a user, at home or at work, to help this user evaluate and control his level of stress

7.4. International Initiatives

7.4.1. International Partners

- Institute for Infocomm Research (I2R), Singapore - Wadsworth Center, Albany, USA and Kansas University, USA.
Topic: Analysis of speech production and perception from ECoG signals
- BIG (Bristol Interaction Group), University of Bristol, UK.
Topic: 3D User Interfaces and Musical Performance.

7.5. International Research Visitors

7.5.1. Visits to International Teams

- A. Cohé visited the BIG (Bristol Interaction and Graphics), in Bristol, UK, during 1 month
- F. Berthaut visited the Center for Computer Research on Music and Acoustics (CCRMA) of Stanford University, USA, during 2 months
- J. Laviolle did a 3 month internship at Microsoft Research Redmond, USA

REVES Project-Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. ANR ALTA

Participants: Emmanuelle Chapoulie, Adrien David, 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 solutions that can be used in Virtual Reality solutions, for example in the context of the immersive space.

7.1.2. ANR DRAO

Participants: Emmanuel Iarussi, Adrien Bousseau.

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 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.

7.1.3. ADT Interact3D

Participants: Adrien David, George Drettakis.

This ADT involves half time software development for ARC NIEVE, and the other half general support to the new Immersive Space Gouraud-Phong in Sophia-Antipolis (supervised by Jean-Christophe Lombardo of the DREAM service). The main contribution was the complete rewrite of our VR application environment with the development of the Imerse software. This platform will allow first experiments, and the development of a generic Virtual Reality framework addressing neuroscience/psychology applications. This generic platform is based on osgVR which aims at a high-quality context abstraction to be usable in several domains, as well as distributed rendering capacities. These improvements, deployable for a variety of applications to come, are tightly coupled with the current ARC NIEVE, thus contributing to its implementation. Future prospects for the ADT Interact 3D include developing novel multimodal interaction techniques for example for gesture-based interaction etc.

7.1.4. ARC NIEVE: Navigation and Interfaces in Emotional Virtual Environments

Participants: Peter Vangorp, Adrien David, George Drettakis, Gaurav Chaurasia, Emmanuelle Chapoulie.

The goal of this joint research project is to develop and evaluate improved interfaces for navigation in immersive virtual environments (VEs) such as the 4-wall stereoscopic ISpace system in the Immersive Space Gouraud-Phong.

There is evidence of significant overlap in brain structures related to spatial memory and orientation and those related to emotion. We examine the influence of high-quality 3D visual and auditory stimuli on the emotions evoked by the virtual environment. Our study focuses on the phobia of dogs as a way to modulate emotion in audiovisual VEs (see Figure 13).

Navigation in VEs involves the use of different views, i.e., egocentric (“first person”) and allocentric (“bird’s eye”) views during navigation tasks. We study appropriate visual representations for each view (for example, the level of realism ranging from abstract map-like rendering for top-down views to photorealistic rendering for first-person views), and appropriate transitions between the different views.

We develop an appropriate methodology to evaluate such navigation interfaces in stressful environments, based on the insights gained by the emotion modulation study in phobic settings. This novel methodology can be seen as a “stress-test” for navigation interfaces: if the navigation interfaces developed are successful even in stressful setups, they will definitely be successful under “normal conditions”.

ARC NIEVE has resulted in several publications this year: [21], [13].



Figure 13. A person immersed in a virtual environment where the behaviors of several dogs will evoke different levels of anxiety.

This is a joint research project with Isabelle Viaud-Delmon (IRCAM, CNRS), Anatole Lécuyer and Maud Marchal (VR4I project team, IRISA-INSA/Inria Rennes - Bretagne Atlantique), and Jean-Christophe Lombardo (DREAM / Inria Sophia Antipolis). Interact3D (Section 7.1.3) is associated with this ARC.

7.1.5. National French Bilateral Collaboration

We have ongoing collaborations with Maud Marchal and Anatole Lécuyer (VR4I project team, IRISA-INSA/Inria Rennes - Bretagne Atlantique) [13], [17], and Bruno Galerne (ENST/ENS Cachan) [15].

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/>

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 first year period (October 2011 - September 2012), the consortium focused its effort on the following main actions:

- Designing scenarios for different situations, 3 main scenarios were designed:
 1. DogPhobia scenario (for phobias),
 2. Kitchen scenario (for Alzheimer patients),
 3. MeMoVE (for memory complaints).
- Ethical approvals submission for the different scenarios.
- Conducting different experiments in the context of these different scenarios, especially DogPhobia scenario.
- Development and adaptation of different technologies in order to implement the scenarios:
 - Image based rendering (IBR) for virtual realistic environment modeling,
 - Emotive avatars,
 - Crowds simulation,
 - Realistic human skin rendering.
- Development of different technical tool:
 - Virtual environment for mobile device serious game (Kitchen scenario),
 - Porting the IBR to immersive space for the MeMoVE scenario,
 - Adapting the partner's technologies to the different platforms within the consortium.

The first year review of the VERVE project was hold on October 2nd, 2012, and the project were judged good and follows the defined plan.

7.3. International Initiatives

7.3.1. Inria Associate Teams

7.3.1.1. CRISP

Title: Creating and Rendering Images based on the Study of Perception

Inria principal investigator: Adrien Bousseau

International Partner (Institution - Laboratory - Researcher):

University of California Berkeley (United States) - Electrical Engineering and Computer Science - Maneesh Agrawala

Duration: 2011 - 2013

See also: <http://www-sop.inria.fr/revs/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 will 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 will explore the following research directions :

Perception: Images are generated from the interaction of lighting, material, and geometry. We will 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. We have started several projects on the perception of materials in realistic and non realistic images, with promising results.

Rendering: We will 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. Current projects on rendering include work on enhancing material variations in realistic and non realistic rendering.

Interaction: We will facilitate the creation of material, lighting, and geometric effects in synthetic images by developing novel user interfaces for novice and professional users. We are currently working on interfaces to draw object appearance and to relight photographs.

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.

7.4. Bilateral Collaborations

7.4.1. France-USA

Participants: Gaurav Chaurasia, Pierre-Yves Laffont, Adrien Bousseau, George Drettakis, Christian Richardt, Jorge Lopez-Moreno.

We have an ongoing collaboration with Yale University (Holly Rushmeier and Julie Dorsey), on weathering, resulting in the publication [17]. We continue this collaboration on stone aging.

We have an ongoing collaboration with Adobe Research (Sylvain Paris) and MIT (Fredo Durand) on intrinsic images for mutiple lighting conditions, resulting in the publication [19].

We also collaborate with M. Banks, R. Ramamoorthi and M. Agrawala from the University of California, Berkeley in the context of our CRISP associate team, resulting in the publications [14], [12]. Gaurav Chaurasia spent 6 weeks this summer at UC Berkeley in the context of this collaboration. Adrien Bousseau and George Drettakis also visited UC Berkeley for 3 days in August.

7.4.2. *France-Switzerland*

Participants: Gaurav Chaurasia, Sylvain Duchêne, George Drettakis.

We collaborate with O. Sorkine at ETH Zurich on image-based rendering, which resulted in a submission to ACM TOG.

7.4.3. *France-Germany*

Participant: George Drettakis.

We collaborate with the Max-Planck-Institut, Germany, where P. Vangorp is now a PostDoc. We collaborate on perception techniques for rendering and on interactions for virtual environments. This resulted in the following publication [13].

7.4.4. *France-Spain*

Participants: George Drettakis, Adrien Bousseau.

We collaborate with C. Bosch who is now at the University of Girona (Spain), on weathering.

7.4.5. *France-Italy*

Participant: Adrien Bousseau.

We collaborate with F. Pellacini from Sapienza Università di Roma on lightfield editing.

7.4.6. *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. This collaboration resulted in the publication [20] and in the 3 weeks visit of Xu Baoxuan (PhD student at U. British Columbia).

7.4.7. *France-Belgium*

Participant: George Drettakis.

We have continued the collaboration with A. Lagae from the Catholic University of Leuven, resulting in the publication [15].

7.5. International Research Visitors

7.5.1. *Visits of International Scientists*

We hosted several researchers this year:

- Maneesh Agrawala (Univ. of Berkeley), in May-June
- Brian Curless (Univ. of Washington), in October
- Eugene Fiume (Univ. of Toronto), in June
- Michael Gleicher (Univ. of Wisconsin), in June
- Diego Gutierrez (Univ. of Zaragoza), in October
- Ares Lagae, (KU Leuven), in November
- Hendrik Lensch (Univ. of Ulm), in October
- Pierre Poulin (Univ. of Montreal), in May
- Alla Sheffer (Univ. of British Columbia), in May-June
- Karan Singh (Univ. of Toronto), in May-June
- Kartic Subr (Univ. College London), in March
- Peter Vangorp (Univ. Giessen), in September and November
- Romain Vergne (Univ. of Giessen), in March
- Brian Xu (Univ. of British Columbia), in September-October

7.5.1.1. Internships

Emmanuel IARUSSI (from Mar 2012 until Aug 2012), Inria Internship Program

Subject: Computer-assisted drawing lessons

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

Felicitas Hetzelt (from Mar 2012 until Aug 2012)

Subject: Computer-assisted drawing lessons

Institution: University of Erlangen (Germany)

VR4I Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. FUI SIFORAS

Participants: Bruno Arnaldi [contact], Valérie Gouranton [contact], Thomas Lopez.

SIFORAS (Simulation for training and assistance), based on GVT 5.2 , aims to propose Instructional Systems Design to answer the new objectives of training (Intelligent Tutorial System, mobility, augmented reality, high productivity).

SIFORAS involves Academic partners 4 (INSA Rennes, ENIB, CEA-List, ENISE) and 9 Industrial partners (Nexter Training, Delta CAD, Virtualys, DAF Conseils, Nexter Systems, DCNS, Renault, SNCF, Alstom).

In this project, INSA Rennes-VR4i aims ensuring consistency with respect to CORVETTE project (see section 7.1.3) in particular for the global architecture based on STORM and LORA models.

7.1.2. ANR Collaviz

Participants: Thierry Duval [contact], Valérie Gouranton [contact], Cédric Fleury, Van Viet Pham.

Collaviz is an innovative multi-domain remote collaborative platform (project ANR-08-COSI-003-11 funded by the french national research agency) for the simulation-based design applications.

Collaviz was involving 6 Academic partners (ECP, EGID, INPT, INSA Rennes, LIRIS, Scilab) and 11 Industrial partners (Artenum, BRGM, Distene, EDF, Faurecia, Medit, MCLP Consulting, NECS, Oxalya, TechViz, Teratec). The Collaviz ended at on 30th June 2012.

The major value brought by Collaviz to the scientific and industrial community is to make remote analysis and collaboration easily available and scalable. Web-based technologies, on the top of shared high-performance computing and visualization centers, will permit researchers and engineers handling very large data sets, including 3D data models, by using a single workstation, wherever in the world. Just a "standard" internet connexion will be needed. The classical approach is not adapted anymore: simulation-based design applications tend to generate Terabytes and even Petabytes of data.

We were leading the WP4 about Collaborative Virtual Environments and Techniques, whose aim was to manage the 3D collaborative interactions of the users. During 2012 we contributed to the second Collaviz prototype by building upon it new collaborative interaction metaphors. We also improved the Collaviz software architecture in order to provide interoperability, making it possible to share a virtual universe between heterogeneous 3D viewers. We added a JMonkeyEngine viewer dedicated to deploy Collaviz on mobile devices such as tablets. We also made a link with the VCoRE project by adding a C++ OpenSG viewer to the our Java Collaviz framework.

We have also deployed the Collaviz framework between London (in the immersive room of the University College of London) and Rennes (in our Immersia room). We setup an experiment of collaborative manipulation of a clipping plane inside 3D scientific data within VISIONAIR project. This first real deployment of Collaviz was a success, it has allowed efficient co-manipulation of a shared 3D object between two really distant users, and the experimental results have been presented in [20]. Collaviz has then been deployed in the Inria Sophia-Antipolis immersive system in the context of the VCoRE project.

7.1.3. ANR Corvette

Participants: Bruno Arnaldi [contact], Valérie Gouranton [contact], Florian Nouviale, Andrés Saraos Luna.

Corvette (CollaboRative Virtual Environment Technical Training and Experiment) based on GVT 5.2 , aims to propose a set of scientific innovations in industrial training domain (maintenance, complex procedures, security, diagnostic, ...) exploiting virtual reality technologies. This project has several scientific axes : collaborative work, virtual human, communication and evaluation.

Corvette involves 3 Academic partners (INSA Rennes, ENIB, CEA-List) and 4 Industrial partners (AFPA, Nexter Training, Virtualys, Golaem). We (INSA Rennes) are leading the ANR Corvette.

The project seeks to put in synergy a number of scientific axes:

- Collaborative work that can handle representative complex scenarios of industrial training
- Virtual Human for its ability to embody the user as an avatar and acting as a collaborator during training
- Natural communication between users and virtual humans for task-oriented dialogues
- Methodology in cognitive psychology for the assessment of the effectiveness of the collaboration of users and virtual humans to perform complex cooperative tasks in a virtual environment.

Unit contributions and technologies are demonstrated. Each partner has integrated global constraints of the project to produce the technical elements in relation to their contributions. The next step is to combine the components into a unified environment and have it validated by industrial use cases.

For further information: <http://corvette.irisa.fr/>

7.1.4. ANR Acoustic

Participant: Maud Marchal [contact].

The main objective of the project ACouStiC is to develop an innovative strategy based on models for helping decision-making process during surgical planning in Deep Brain Stimulation. Models rely on different levels involved in the decision-making process; namely multimodal images, information, and knowledge. The project aims at developing methods for 1) building generic and patient specific models and 2) automatically computing optimal electrodes trajectories from these models taking into account possible simulated deformations occurring during surgery. VR4i is involved in the project with Shaman Inria project-team and aims at providing models of deformations of the cerebral structures and electrodes for the surgical planning. The objective is to propose a biomechanical approach to model the brain and electrode deformations and also their mutual interaction.

7.1.5. ANR Open-ViBE2

Participants: Laurent Bonnet, Laurent George, Anatole Lécuyer [contact], Jozef Legeny.

OpenViBE2 is a 3-year project funded by the French National Agency for Research. The objective of OpenViBE2 is to propose a radical shift of perspective about the use of Brain-Computer Interfaces (BCI). First, in OpenViBE2 we consider the possibility to merge a BCI with traditional peripherals such as joysticks, mice and other devices, all being possibly used simultaneously in a virtual environment. Therefore, BCI is not seen as a replacement but as a complement of classical HCI. Second, we aim at monitoring brain cognitive functions and mental states of the user in order to adapt, in real-time and in an automated fashion, the interaction protocol as well as the content of the remote/virtual environment (VE).

One major strength of OpenViBE2 consortium relies on the fact that four partners were already involved in the previous ANR project OpenViBE1 (2005-2009): Inria, INSERM, GIPSA-LAB, CEA. In addition, six partners have joined OpenViBE2 to bring their complementary expertise required by the scope of our proposal: CHART, CLARTE, UBISOFT, BLACK SHEEP, and KYLOTONN.

In parallel, the OpenViBE2 consortium contributes to the free and open-source software OpenViBE, which is devoted to the design, test and use of Brain-Computer Interfaces (see Section 5.3).

7.1.6. ANR HOMO TEXTILUS

Participants: Anatole Lécuyer [contact], Jozef Legeny, Maud Marchal, Jonathan Mercier.

HOMO TEXTILUS is a 3-year project funded by the French National Agency for Research (2012-2015). The objective of HOMO TEXTILUS is to study what could be the next generation of smart and augmented clothes, and their influence and potential impact on behavior and habits of their users. The project is strongly oriented towards human science, with both user studies and sociological studies. The involvement of VR4i team in the project consists in contributing to the design of next-gen prototypes of clothes embedding novel kinds of sensors and actuators. Envisionned sensors relate to physiological measurements such as with EEG (electroencephalography and Brain-Computer Interfaces), EMG (muscular activity), GSR (galvanic skin response) or Heart Rate (HR). Envisionned actuators relate to new sensory stimulations such as vibrotactile displays or novel visual (eg LED) displays. These prototypes will thus be used in the various experiments planned in the project.

Partners of the project are : Inria, CHART, LIP6, TOMORROW LAND, RCP and potential end-user is Hussein Chalayan fashion creator.

7.1.7. ANR MANDARIN

Participants: Anatole Lecuyer [contact], Maud Marchal [contact], Merwan Achibet.

MANDARIN is a 3-year project funded by the French National Agency for Research (2012-2015). The objective of MANDARIN is to study the design of truly dexterous haptic peripherals allowing natural and intuitive mono or bi-manual interactions with force feedback in virtual environments. The design of an innovative and comfortable and high performance force feedback glove is planned in the project, based on accurate biomechanical models of the human hand. The involvement of VR4i team in the project consists in contributing to the design of novel multimodal 3D interactions techniques and metaphors allowing to deal with haptic gloves limitations and to assist the user in virtual applications requiring dexterous manipulation. The scientific results will be evaluated with a representative industrial application proposed by Renault, that is not feasible currently with existing technologies (bi-manual manipulation of complex rigid objects and cables bundles).

Partners of the project are : Inria, CEA, UTC, Haption, Renault (potential end-user)

7.2. European Initiatives

7.2.1. INFRA-FP7: VISIONAIR

Participants: Georges Dumont [contact], Bruno Arnaldi, Valérie Gouranton, Thierry Duval, Alain Chauffaut, Ronan Gaugne.

Our actual Virtual Reality systems allowed us to be a key partner within the European Project VISIONAIR (<http://www.infra-visionair.eu/>) that began in February 2011 in the infrastructure call of FP7. Our Immersia (see section 6.4) Virtual Reality room is now, in Europe, a key place for virtual reality. We are leading the Work Package 9 on Advanced methods for interaction and collaboration of this project and are deeply involved in the directory board and in the scientific piloting committee. The VISIONAIR project's goal is to create a European infrastructure that should be a unique, visible and attractive entry towards high level visualization facilities. These facilities will be open to the access of a wide set of research communities. By integrating our existing facilities, we will create a world-class research infrastructure enabling to conduct frontier research. This integration will provide a significant attractiveness and visibility of the European Research Area. The partners of this project have proposed to build a common infrastructure that would grant access to high level visualization and interaction facilities and resources to researchers. Indeed, researchers from Europe and from around the world will be welcome to carry out research projects using the visualization facilities provided by the infrastructure. Visibility and attractiveness will be increased by the invitation of external projects.

This project is built with the participation of 26 partners, INPG ENTREPRISE SA IESA France , Institut Polytechnique de Grenoble France, University of Patras LMS Greece, Cranfield University United Kingdom, Universiteit Twente Utwente Netherlands, Universitaet Stuttgart Germany, Instytut Chemii Bioorganicznej Pan Pscn Poland, Université De La Méditerranée D'aix-Marseille II France, Consiglio Nazionale Delle Ricerche CNR Italy, Institut National de Recherche en Informatique et en Automatique Inria France, Kungliga Tekniska Hoegskolan Sweden, Technion - Israel Institute of Technology Israel, Rheinisch-Westfaelische Technische Hochschule Aachen RWTH Germany, Poznan University of Technology Poland, Arts et Métiers ParisTech AMPT France, Technische Universitaet Kaiserslautern Germany, The University of Salford United Kingdom, Fraunhofer-gesellschaft zur foerderung der Angewandten Forschung Germany, fundacio privada I2CAT Spain, University of Essex United Kingdom, Magyar Tudomanyos Akademia Szamitastechnikai Es Automatizalasi Kutato Intezet Hungary, École Centrale de Nantes France, University College of London United Kingdom, Politecnico di Milano Polimi Italy, European Manufacturing and Innovation Research Association (cluster leading excellence).

7.2.2. **STREP: NIW**

Participants: Gabriel Cirio, Anatole Lécuyer [contact], Maud Marchal, Léo Terziman.

The Natural Interactive Walking Project (NIW) is a 3-year project funded by the European Commission under the FET Open STREP call. NIW involves 5 partners: Inria/VR4i (Bunraku), University of Verona (leader), University of Aalborg, University of Paris 6, and McGill University. The Natural Interactive Walking (NIW) project aims at taking advantage of multisensory information about the ground to develop knowledge for designing walking experiences. This will be accomplished through the engineering and perceptual validation of human-computer interfaces conveying virtual cues of everyday ground attributes and events. Such cues may be conveyed by auditory, haptic, pseudo-haptic, and visual augmentation of otherwise neutral grounds. The project is focused on creating efficient and scalable display methods across these modalities that can be easily and cost-effectively reproduced, via augmented floors and footwear.

It is expected that the NIW project will contribute to scientific knowledge in two key areas. First, it will reinforce the understanding of how our feet interact with surfaces on which we walk. Second, it will inform the design of such interactions, by forging links with recent advances in the haptics of direct manipulation and in locomotion in real-world environments. The methods that will be created could impact a wide range of future applications that have become prominent in recently funded research within Europe and North America. Examples include floor-based navigational aids for airports or railway stations, guidance systems for the visually impaired, augmented reality training systems for search and rescue, interactive entertainment, and physical rehabilitation.

More information can be found on Natural Interactive Walking project website : <http://www.niwproject.eu/>

7.2.3. **BRAINVOX**

Participants: Anatole Lécuyer [contact], Jozef Legeny [contact].

The BRAINVOX project is a project funded by Brittany region in the frame of the CREATE call. It is a 4 year-project (2008-2012), on the topic of Brain-Computer Interfaces.

The "blue-sky" vision of the BrainVox project is a "mental language", more elaborated, and richer, for BCI applications. We want to study the possibility for a single user to exploit various mental activities, in order to achieve more varied operations in the BCI-based application within novel hybrid BCI schemes. In the end, this novel mental language would enable a practice of BCI richer and more intuitive, with more potential actions in the real world. This should improve the spreading of BCI technologies in numerous applications such as multimedia and video games, but also assistance to disabled people.

7.2.4. **ADT-Mixed Reality Technological Development: VCore**

Participants: Georges Dumont [contact], Thierry Duval, Valérie Gouranton, Alain Chauffaut [contact], Ronan Gaugne [contact], Rémi Félix.

The Mixed Reality Project is a shared collaboration between Fraunhofer IGD and five Inria research centers: Rennes, Grenoble, Sophia, Lille and Saclay. On the Inria side, the project started in October 2011, with a four-year outlook, as an ADT with two IJDs, one in Rennes and one in Sophia. The goal of the project is to build a modular shared source software framework, fostering the development of new and unique research topics and application areas, which can be used alike by research teams and innovative companies. The goal is to make it a de facto standard, favoring interoperability between various developments in the mixed reality area. Research teams will get a sound software base that helps them focus their efforts on innovative software libraries or applications. Companies will benefit from implementations of state-of-the-art algorithms as well as a full-fledged framework strongly connected with 3D-related emerging standards like Collada, X3D and WebGL.

AXIS Project-Team

6. Partnerships and Cooperations

6.1. Regional Initiatives

6.1.1. PREDIT (ADEME) TIC TAC (2010 - 2012)

Participants: Carole Goffart, Guillaume Pilot, Bernard Senach, Brigitte Trousse, Florian Bonacina.

Title: TIC TAC

Type: PREDIT groupe 3, Mobilité dans les régions urbaines

Challenge: Information and Communication Technologies – Transportation

Instrument: Mobilité dans les régions urbaines

Duration: 2010 - March 2012

Coordinator: VuLOG

Others partners: MHC Conseils

Abstract: TICTAC project aims at providing an advanced travellers' information system in which real time information about waiting time at bus stop will be available: users define their "favourite" and can call a vocal server which give them immediately the requested information.

This year, we conducted a second experimentation with an improved version of real-time information system. Main modification were : a lighter interaction with the vocal server, simpler registration procedure, on-line memo ... The experiment started in January 2012 and lasted till end of February and 62 people registered to the experiment [57]. The quantitative log analysis was articulated with two appreciation questionnaires. Results show that there was few access to the vocal server and a small rise of web server consultation in comparison with the first experimentation. The error rate and the response time were rather high and the users didn't have a very good experience with the service. The service was acknowledged as very useful and the user interface was perceived as easy to use but TICTAC didn't met its users expectations: very few of them used it on a daily basis [52], [51].

The second experimentation was also a good opportunity to test our new approach of co-creation and we conducted a workshop with users to identify functionalities of a real-time traveler information system and to test a first mock-up.

6.1.2. PACALABS HOTEL-REF-PACA (2010 - 2012)

Participants: Florian Bonacina, Bernard Senach, Brigitte Trousse, Yves Lechevallier, Nicolas Béchet, Ehab Hassan.

Title: HOTEL-REF-PACA

Type: PACALABS

Challenge: Referencing Accommodation Web Sites in PACA Region

Instrument: PACALABS (Paca Region and FEDER fundings)

Duration: October 2010 - May 2012

Coordinator: Full performance

Others partners : General Council of Maritim Alps

This project is conducted with Full Performance, a SME specialized in Web site referencing. It aims at improving hinterland tourism and hotel-keepers as well as tourists are involved in the experimentation. Experiments of different new referencing rules are conducted with Web site visitors in order to study their effect on behavioral changes and on touristic choices. The experimentation consists in three stages: current referencing rules are first studied and their efficiency estimated through eye-tracking experiments. Then new rules are explored and tested with users. When the convenient new rules are selected, their efficiency is evaluated through data mining analysis and qualitative studies.

Due to some delay in the experiment (mainly tag installation, data access), our task related to data analysis was postponed until May 2012. This year we conducted several eye tracking studies on different sites (general council 06 in Nice, Draguignan citizen space, Inria) in order to understand the visual search behavior when looking for ill-defined or well defined targets on a Google results page. The results show that commercial ads are rarely looked at and that for the intended users (touristic hosts) a good natural referencing is more efficient than commercial ads. The impact of ergonomic recommendations about web site users interface provided to hotel and restaurant owners participating in the project was evaluated. The pool showed that the participant had a deeper understanding of on line referencing and awareness of the weight of usability quality [54], [44], [42], [43], [45].

6.1.3. PACALABS ECOFFICES (2010 - 2012)

Participants: Guillaume Pilot, Yves Lechevallier, Bernard Senach, Brigitte Trousse [correspondant].

Title: ECOFFICES

Type: PACALABS

Challenge: Energy Challenge within Offices

Instrument: PACALABS (Paca Region and FEDER fundings)

Duration: august 2010 - november 2011

Coordinator: Osmose

Others partners: CASA, CSTB

See also: <http://www.ecoffices.com/>

Abstract: ECOFFICES is an eco-challenge within an enterprise: offices are equipped with sensors and actuators. Actions of employees on actuators are registered and consumption behaviors are tracked. The experimentation consists in three successive stages: data are first recorded during the usual work of the challengers, then feed-back is provided through user interface and in the challenge phase, 3 teams are competing to reach the best economy level. After the challenge, registered data are analysed to study the change of practices, if any. The goal of the project is to provoke behavioral changes and our team is in charge of the evaluation.

The ECOFFICES project based on the concept of **energy challenge** in tertiary sector ended officially in november 2011, but due to the complexity of cleaning data before data analysis, we analysed usage data and IoT data up to February 2012. The final assessment showed that the participation rate was higher than expected. The most notable behavior change at the office concerns a declared increase of switching off of aircon and electrical devices when leaving the office for a long time. At the end of the challenge, participants were not convinced about effective savings and the sustainability of emergent eco-behaviour is questioned. Our main contribution is described in Section 5.5.3 and reported in three main deliverables related to the qualitative and quantitative analysis of experimental data, which are summarised in [64] and the final report [62].

6.1.4. PACALABS ECOFAMILIES (2011- 2012)

Participants: Xavier Augros, Florian Bonacina, Brigitte Trousse [correspondant].

Title: ECOFAMILIES

Type: PACALABS

Challenge: Design by end users of an user interface for energy savings

Instrument: PACALABS (Paca Region and FEDER fundings)

Duration: October 2011 - October 2012

Coordinator: CSTB

Others partners : University of Nice Sophia Antipolis (I3M), NCA

See also: <http://www.ictusagelab.fr/projet/ecofamilies> for a summary of the main outcomes of the project.

The ECOFAMILIES project has proposed to prototype and experiment an innovative technological solution to promote energy-aware behaviors at home, through a participatory design approach. A web-based user interface has been developed by SME Ekenos (Italy). It provides a set of customized contents, ranging from basic information to proposal of actions aiming at reducing energy consumption.

ICT Usage Lab (cf. section 6.1.8) was a sponsor partner and was represented in this project by AxIS team for advices on the experimentation and co-design protocol (through the supervising committee) and various supports to partners related to the dissemination via the Web site, to the workshop animation and Focuslab tools (Sphinx tool, Eye-tracker,) and to the redaction of some deliverables (D2,D3, D3.2 and the final report [61]).

For some pictures of such workshops: <http://www.flickr.com/photos/ecofamilies/> ECOFAMILIES Was presented during a report at TV during the 19-20 journal France 3 on October 17. See also a summary of the project ECOFAMILIES on the Web site [69].

6.1.5. CPER Telius - FocusLab (2008 - 2013)

Participants: Xavier Augros, Guillaume Pilot, Brigitte Trousse [correspondant].

This grant, funded by Regional and European support, covers 3 areas: an experimental platform for research on telecommunication networks, a software and informatics platform (including a virtual reality environment, a medical imaging platform, and a peer-to-peer computing grid), and an experimental platform on the usage of information systems. AxIS is being funded through the experimental platform on the usage of information systems called Focus (and renamed FocusLab) (cf. section 5.6).

Projects using elements of the FocusLab platform are reported in [70]. The following list identifies AxIS projects where our platform was used: TIC TAC, ECOFFICES, ECOFAMILIES. In addition to others Inria teams (WIMMICS, REVES), we can cite external organisations/teams: I3M laboratory from university of Nice Sophia Antipolis, CSTB (Sophia Antipolis), the Ergonauts Association, Elliot partners such as BIBA (Germany) and HSR (Italy).

6.1.6. IMREDD

Participant: Brigitte Trousse [correspondant].

Our activities on Internet of things (IoT), Environment and Health&Well Being, mainly led in the context of the european ELLIOT Project (cf. section 6.3.1.1) are related to “Environment and health”, one of the three topics of the Mediterranean Institute of Risks, Environment and Sustainable development (IMREDD⁷ in French). This institute is in relation to the EcoCampus of the OIN (*Opération d'intérêt National de la Plaine du var* (University of Nice Sophia Antipolis and Nice Côte d'Azur Metropole).

URL: <http://unice.fr/universite/imredd>

6.1.7. Labex UCN@Sophia

Participant: Brigitte Trousse.

Title: User-Centered Network

URL: <http://www.ucnlab.eu/>

Instrument: Labex

Coordinator: University of Nice - Sophia Antipolis

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

⁷IMREDD: Institut Méditerranéen des Risques, de l'Environnement et du Développement Durable

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: e-Health to allow persons with reduced autonomy to remain at home and Intelligent Transport Systems.

AxIS is mainly concerned by Intelligent Transport Systems (mainly by co-creating ITS applications with users and stakeholders) and potentially all the research directions involving users. AxIS experience in ITS domain is based on various projects (c. section 3.2).

6.1.8. ICT Usage Lab

Participants: Brigitte Trousse [correspondant], Bernard Senach.

This year was rich in concrete projects with experiments with citizens or professionals for various members of ICT Usage Lab: CSTB, I3M (UNiversity of Nice Sophia Antipolis) and AxIS (Inria).

The FocusLab platform (CPER Telius 6.1.5) has been available to ICT Usage Lab projects and to other experiments by academics or association of PACA region: EPI Reves (Inria), CSTB, I3M (University of Nice) and the association Ergonautes.

ICT Usage Lab was partner of the Innovatice City Convention event organised in June 2012 (Nice Côte d'Azur): <http://www.innovative-city.fr/partenaires/partners/>. In this context we invited two speakers for ICC 2012: Michael Nilsson (CDT, Lulea, Finland) and Khaldoun El Agha (ICT Labs - EIT, Paris).

ICT Usage Lab have several dissemination activities related to ECOFAMILIES, ECOFFICES and ELLIOT projects at the European level.

ICT Usage Lab was co-founder of the Association France Living Labs (cf. section 6.2.4).

Let us note the visit of Noel Conryut from the living lab for Teaching and Learning (Island of the Reunion) at the end of December in order to identify collaboration topics with our living lab.

6.1.9. Involvement in Regions

PACA Region

- B. Trousse as Inria representative is a member of the expert committee of the PACALABS and of the strategic committee of the PACALABS orientation of the Regional Council.
- B. Trousse and B. Senach are members of the coordination committee of the ICT Usage Lab (Inria, CSTB, Orange Labs and UNS).
- B. Senach and B. Trousse pursued the reactivation started in 2008 of the living lab ICT Usage Lab by increasing our contacts with territories and academics disseminating the living lab approach and/or involving them as supporters or partners of experiments. This year, in addition to previous contacts (NCA, CASA, CG06) we had fruitful meetings with PAP (Pôle Azur Provence, a cluster of hinterland territorial communities) to set up collaboration about ecological behaviour changes and with CG06 about eco-tourism. Inside ICT Usage Lab, we had contacts with I3M (University of Sophia Antipolis) involved in the ECOFAMILIES project. See the activities of ICT usage lab (cf. section 6.1.8).
- B. Senach, G. Pilot and B. Trousse had contact with ADEME and CASA in order to promote the real-time traveler information system MOBILTIC which capitalized on the TicTac Project.
- B. Trousse (Inria and ICT Usage Lab representative) was member of the program committee of Innovative City Convention (ICC) 2012 (Nice).
- AxIS as responsible of Elliot experiments has established relations with the Environment department of the urban community of Nice Côte d'Azur (NCA) and CHU Nice in order to organize co-creation workshops.

- B. Trousse gave a talk about ECOFFICES project at the smart grid group (Cap Energies and SCS clusters).
- B. Trousse met in January Stéphane Delalaye from Arsenic association (PACA). Following this contact, we have the opportunity to organise one experiment for HOTEL-REF-PACA in a citizen space at Draguignan (ERIC) and another one for the ELLIOT project in the Hublot (ERIC, Nice).
- AXIS organised two Elliot workshops for professionals (Health & Environment) in the Environment department of Nice Côte d'Azur (cf. section 6.3.1.1).

Midi Pyrénées Region

- AxIS (C. Detraux and D. L. Scapin) are involved in ANR-PIMI project (cf. section 6.2.1) where the Midi-Pyrénées region and IUT Tarbes are pilot-partners.

6.2. National Initiatives

6.2.1. ANR PIMI (2010 - 2013)

Participants: Claudia Detraux, Dominique Scapin [correspondant].

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 5.4.1.

6.2.2. FIU FIORA (2012-2015)

Participants: Yves Lechevallier [correspondant], 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 personalised 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 techniques, recommendation techniques based on collaborative filtering and data mining. The proof concept will be experimented in two domains: a) Nutrition and Health (use of the cohort Nutrinet with more than 200 users) and b) e-tourism.

This project starts at the end of 2012.

6.2.3. Competitvity Clusters

Cap Digital: B. Trousse was reviewer for the selection of proposals for Cap Digital competitively cluster related to the call for Projects “Expérimentation in situ et in vivo de projets” (deadline : September 19th) of Paris Region.

SCS and Cap Energies: B. Trousse was invited for a talk on *Ecoffices: the usages aspect* during a meeting (April 19th, Brignoles) of the working group Smart grid in PACA (common to two clusters, SCS and Cap Energies clusters).

6.2.4. France Living Labs

The French Network of Living Labs has created the association named "France Living Labs" (F2L) in order to promote the French Living and to facilitate user-driven open innovation on a national level. From the first ENoLL wave in 2006, the French network of living labs has grown from one ENoLL accredited living lab to 47 living labs up to this date after the ENoLL 6th Wave of Call for Membership applications.

The French Network of Living Labs have had annual meetings since 2008. Due the growing number of the French network of living labs, a majority of living labs (25 among 36) has decided to create an association on March 2012 in order to support operations of its members, mainly for common international/European projects, b) to animate the network, promoting the concept of living lab, supporting the sharing of methods and tools and c) to promote the ENoLL label and the Living lab approach by organizing various events and to finally contributing to the maturity of Living Labs European initiative by capitalizing knowledge and experiences and to support the defining KPI indicators for impact assessment of a Living Lab.

ENoLL and France Living Labs are looking into opportunities of closer communication and cooperation in their activities and initiatives through meetings, exchanging of information, knowledge, experiences and best practice. This will be done through signing a formal cooperation agreement (MoU).

B. Trousse (Inria) and A. Zarli (CSTB) are the official representatives of the ICT Usage Living Lab which is a founding member of France Living Labs and member of the administration council. Brigitte Trousse was elected President of the Association in the administration council of april 2012. The association wrote a press communication on June 18.

Three Council Meetings: august (Universcience, Paris), may and october (Inria, Paris).

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

6.3. European Initiatives

6.3.1. FP7 Projects

6.3.1.1. STREP ELLIOT (2010 - 2013)

Participants: Anne-Laure Negri, Mylène Leitzelman, Bernard Senach, Caroline Tiffon, Brigitte Trousse [correspondant].

Title: Experiential Living Lab for the Internet of Things

Type: COOPERATION (ICT)

Defi: Internet of Things and enterprise environments

Instrument: Specific Targeted Research Project (STREP)

Duration: September 2010 - February 2013

Coordinator: TXT Polylemia (Italy)

Others partners:

See also: <http://www.elliott-project.eu/>

Abstract: The ELLIOT project (Experiential Living Labs for the Internet of Things) aims at developing an Internet Of Things (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 the following activities:

- 3 co-conception workshops (1 group of health and/or air professionals) were held in order to identify the ideas and positions of professionals related to potential internet of things services based on air and noise measurements. These workshops took place in Nice during spring 2012; both Aloha! and GenIoT co-creation methods were used and an evaluation of these methods is reported in Section 5.5.2 and [56].
- An experiment with IoT probe (a fake green watch) was run in order to test the online diary and data analysis.
- Specification of the methodology for user experience measurement for Green Services Use case and application for deliverables [50], [63].
- Implementation of MyGreenServices application which collects IoT data from electric cars and citizens sensors and provides some services such as alerts. Usage data are stored in order to be sent to the ELLIOT platform.
- Development of Focuslab V1.3 (cf. section 5.6) in relation to the ELLIOT platform..
- Contribution to a lot of deliverables, five public [47], [46], [55], [50], [63] and three others.
- Co-organisation of two workshops on user experience measurement (KSB model, use cases, data analysis) at Inria Sophia Antipolis and one general meeting dedicated to ELLIOT partners.

6.3.1.2. ICT CSA FIREBALL (2010 - 2012)

Participants: Marc Pallot, Brigitte Trousse [correspondant], Caroline Tiffon, Bernard Senach.

Title: FIREBALL

Type: CAPACITIES (ICT)

Defi: Future Internet Experimental Facility and Experimentally-driven Research

Instrument: Coordination and Support Action (CSA)

Duration: May 2010 - April 2012

Coordinator: Luleå University of Technology (Sweden)

Others partners: AALTO (Finland), AENESCEN (Italy), MCC (United Kingdom), SAIM (Netherlands), ESADE (Spain), ALFAMICRO (Portugal), ISA (Portugal), E-NOVA (Portugal) HK (Finland), Inria (France), DIMES (Finland), IBBT (Belgium), AUTH (Greece), OY (Finland), IMAGES & RESEAUX (France), BCN (Spain)

URL: <http://www.fireball4smartcities.eu/>

Abstract: FIREBALL (Future Internet Research and Experimentation By Adopting Living Labs - towards Smart Cities) is a coordination action which establishes a coordination mechanism through which a network of Smart Cities across Europe engages in long term collaboration for adopting User Driven Open Innovation to explore the opportunities of the Future Internet.

We mainly have collaborations with Prof. Dr Nicos Komninos (Faculty of Engineering, Aristotle University of Thessaloni, Greece) and Hans Schaffers (Expert at ESoCE Net, Director of Adventure research, Netherlands) for the two scientific publications [26], the white paper [59] and the deliverables D1.2 [58] and D2.1 [60].

This year we finalize a contribution (about 25 pages) on Paca Region - Sophia Antipolis - Nice Côte d'Azur Assets Case Study for a Fireball deliverable [58].

6.3.1.3. SSH CSA IDEAS (2010 - 2012)

Participants: Yves Lechevallier [correspondant], Marc Csernel, Ehab Assan.

Title: IDEAS

Instrument: Coordination and Support Action (CSA)

Type: CAPACITIES (SSH)

Duration: January 2010 - June 2012

Coordinator: École française d'Extrême Orient (EFEO)

Others partners: Institute of Ethnology of the University of Turku, Hungarian Academy of Sciences, British Academy, Asien-Afrika-Institut of the University of Hamburg, Istituto italiano per l'Africa e l'Oriente (IsIAO).

Abstract: The overall objective of IDEAS is to make progress in coordinating and bringing together academic research, researchers and policy-makers. IDEAS will make use of the expertise and resources of a recently created network, the European Consortium for Asian Field Study (ECAAF), which comprises 44 research institutions from ten EU countries and nine Asian countries and Russia, which specialize in Asian studies, and a network of 22 field research centers run by ECAAF members across Asia. The task attributed to Inria was to provide the pilot of a website devoted to the presentation of Asian manuscripts (France)

The contribution of Axis was not only a pilot, as requested within the contract, but also a methodology leading to the construction of a smart search engine dedicated to the pilot. As a prototype website we took the IsIAO website according to our partner's wishes and because it was an opportunity to get together, at the same place, a set of manuscripts and large collection of photographs: the Tucci's collection. The Tucci's collection was a good opportunity to test our methodology and our search engine. The main goal of our search engine is to provide a "reasonable" amount of answers whatever the question is.

The reason of the construction of this search engine was the observation of a lot of orientalist websites, included the most famous one the such IDP (International Dunhuang Project). We find that after a query done by a naive user (one of us) most of the time we obtained either no answer, either a lot too much of them. This was a strong motivation and our pilot tested on the Tucci's collection provide now a "reasonable" amount of answers either according to one of our queries.

6.3.2. Collaborations in European Programs, except FP7

6.3.2.1. COST TwinTide (2010-2013)

Participant: Dominique Scapin [correspondant].

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 Zürich), 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 artifacts, across sectors and disciplines, bringing together researchers and D&E professionals.

6.3.2.2. EIT ICT Labs

B. Trousse managed several actions related to EIT ICT Labs:

- Participation at the Living Lab Business Models Coaching and Best-practice Sharing workshop (Telecom italia lab, Turin, April 2-3) organised by the Experience & Living Labs (E&LL) catalyst of the Research component of the european institute EIT ICT Labs <http://www.eitictlabs.eu/>
- Interaction with Khaldoun El Agha, Valerie Issarny, Olivier Festor and Bruno le Dantec related to the action line called “Digital Cities of the Future” and Proposition of an invited talk at ICC 2012 <http://www.innovative-city.fr>.
- Participation at the submission at the ICT Labs call (2013) related to E&LL catalyst (which was accepted).

6.4. International Initiatives

6.4.1. Participation in International Programs

6.4.1.1. FACEPE CM2ID, Brazil 2003-2013

Participants: Yves Lechevallier, Marc Csernel.

During 2012 we start a new collaboration on social network data analysis with F.A.T. De Carvalho from Federal University of Pernambuco (Recife) and two Inria Teams AxIS (Inria Rocquencourt) 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 F. De Carvalho and A. Napoli has been accepted 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, 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.

6.4.2. Participation to Standards in Ergonomics

Participant: Dominique Scapin [correspondant].

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) [41].
- 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).

6.5. International Research Visitors

6.5.1. Visits of International Scientists

AxIS Rocquencourt welcomed various international scientists from Brazil:

- Francisco de Carvalho (UFPE, Brazil) [17], [34], [27], [23],
- Sergio Queiroz (UFPE, Brazil) [27],
- Cleber Zanchettin (UFPE, Brazil).

B. Trousse visited in October Hicham Behja which is involved in a new position at the National High School of Electrical and Mechanical engineering (ENSEM) at Casablanca in Morocco in October.

6.5.2. Internships

Bruno ALMEIDA PIMENTEL (from Feb 2012 until Jul 2012)

Subject: Social Network Aggregation

Institution: Federal University of Pernambuco (Brazil)

DAHU Project-Team

6. Partnerships and Cooperations

6.1. European Initiatives

6.1.1. FP7 Projects

6.1.1.1. FOX

Title: FOX

Type: COOPERATION (ICT)

Defi: FET Open

Instrument: Specific Targeted Research Project (STREP)

Duration: May 2009 - September 2012

Coordinator: Inria (France)

Others partners: Thomas Schwentick at the university of Dortmund, Mikołaj Bojańczyk at the university of Warsaw, Leonid Libkin at the university of Edinburgh, Georg Gottlob at the university of Oxford, Frank Neven at the university of Hasselt and Maarten Marx at the university of Amsterdam.

See also: <http://fox7.eu>

Abstract: The objective of FoX is to study the fundamental issues necessary in order to make the data management over the internet more efficient and more reliable.

6.1.2. ERC grant Webdam

6.1.2.1. Webdam

Title: WebDam

Type: IDEAS

Instrument: ERC Advanced Grant (Advanced)

Duration: December 2008 - November 2013

Coordinator: Serge Abiteboul, Inria (France)

Others partners: Pierre Senellart, Telecom Paristech.

See also: <http://webdam.inria.fr>

Abstract: The goal is to develop a formal model for Web data management. This model will open new horizons for the development of the Web in a well-principled way, enhancing its functionality, performance, and reliability. Specifically, the goal is to develop a universally accepted formal framework for describing complex and flexible interacting Web applications featuring notably data exchange, sharing, integration, querying and updating. We also propose to develop formal foundations that will enable peers to concurrently reason about global data management activities, cooperate in solving specific tasks and support services with desired quality of service.

6.2. International Initiatives

6.2.1. Inria International Partners

- Victor Vianu, UC San Diego, USA.

6.3. International Research Visitors

6.3.1. Visits of International Scientists

Victor Vianu (from June 2012 until September 2012)

Subject: WebDaM

Institution: UC San Diego (USA)

Gerome Miklau (from September 2012 to June 2012)

Subject: WebDaM

Institution: University of Massachusetts at Amherst (USA)

6.3.2. Internships

- David Montoya, Webdam, 04/2012 to 09/2012
- Jules Testard, Webdam, 09/2012 to 12/2012

DREAM Project-Team (section vide)

EXMO Project-Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. ANR Datalift

Program: ANT-ContInt

Project acronym: Datalift

Project title: Datalift

Instrument: platform

Duration: September 2010 - March 2014

Coordinator: Inria Exmo/François Scharffe

See also: <http://www.datalift.org>

Abstract: EXMO coordinates with LIRMM the DATALIFT project whose goal is to produce a platform for publishing governmental data as linked data [17]. EXMO is particularly involved in the generation of links between datasets (see §6.2).

7.2. European Initiatives

7.2.1. FP7 SEALS

Title: Semantic Evaluation At Large Scale

Type: CAPACITIES (Infrastructures)

Defi: Scientific Data Infrastructure

Instrument: Combination of COLLABORATIVE PROJECTS and COORDINATION and SUPPORT ACTIONS (CPCSA)

Duration: June 2009 - June 2012

Coordinator: Universidad Politecnica de Madrid (ES)

See also: <http://seals-project.eu>

Abstract:

EXMO is a partner of the SEALS European commission infrastructure project whose goal is to provide the infrastructure for evaluating semantic technologies. Jérôme Euzenat has been vice-coordinator in charge of the research area.

More particularly, EXMO has been in charge of providing an infrastructure for evaluating ontology matching systems and algorithms, to be aggregated in the SEALS platform. This task involves:

- designing evaluation campaigns, including identifying criteria, metrics, datasets, and tools to be used in each campaign,
- designing and implementing services for automatic evaluation of systems and algorithms,
- analysing the results of evaluation campaigns and using them to produce detailed reports on both the effectiveness of the testing methodologies, and the systems that have been tested.

This year we have prepared the second SEALS evaluation campaign and designed a fully automated evaluation process (see §6.1.1).

7.3. International Research Visitors

7.3.1. Visits of International Scientists

Riccardo Albertoni (Universidad Politecnica de Madrid) visited EXMO from October 15th to October 22nd, 2012 working on similarity measures and their application to linked data.

Alexander Borgida (Rutgers University) visited EXMO from April 29th to May 11th, 2012 mostly working on weighted alignment semantics.

Jorge Gracia (Universidad Politecnica de Madrid) visited EXMO from June 4th to July 3rd, 2012, working more particularly on multilingual ontology/instance matching;

Daniel Vila (Universidad Politecnica de Madrid) visited EXMO from April 23rd to July 23rd, 2012 working on data interlinking and multilingual instance matching.

7.3.2. Internships

Thinh Dong (2nd year master «Master Informatique: Fondements et Ingénierie» option «Knowledge Information System», U. Nice Sophia-Antipolis, 2012) on «Query generation from expressive ontology alignments».

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 that started in Oct. 2012. The project coordinator is Odile Papini (LSIS), and 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.

8.1.1.2. Pagoda

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

Pagoda is an ANR JCJC (young researchers) that will begin in Jan. 2013. The project coordinator is Meghyn Bienvenu (LRI), and 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 query answering algorithms and practical methods for handling inconsistent data.

8.1.1.3. Qualinca

Participants: Michel Leclère, Michel Chein, Madalina Croitoru, Lăuza Guizol, Akila Ghersedine, Rallou Thomopoulos, Marie-Laure Mugnier.

Qualinca is an ANR Contint project that started in Apr. 2012 and will end in Sept. 2015. The project coordinator is Michel Leclère (GraphIK), and it involves partners from LRI, LIG, ABES and INA.

The main objective is to elaborate mechanisms allowing to:

- evaluate the quality of an existing documents 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).

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 developing 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, J  r  me Fortin, Patricio Mosse.

FP7-KBEE, March 2011–March2015. Led by INRA (and scientifically managed by Montpellier IATE laboratory). 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-KRR team. The budget is managed by IATE team. This project will feed Axis 2.

- See Sect. 6.2 (argumentation for decision making in agronomy) for the results obtained this year.

8.2.2. Collaborations with Major European Organizations

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: University of Karlsruhe, AIFB (Germany)

Jean-Fran  ois Baget, Marie-Laure Mugnier and Micha  l Thomazo collaborate with Sebastian Rudolph on the study of complexity classes for fragments of existential rules. This successful work has already led to major publications (see Sect. 6.1).

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

Madalina Croitoru collaborates with Srdjan Vesic on the link between inconsistency tolerant reasoning and argumentation.

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

Madalina Croitoru and J  r  me Fortin collaborate with Nir Oren on argumentation and preference logics.

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

Madalina Croitoru collaborates with Ioannis A. Vetsikas on mechanism design aspects of multi-agent knowledge allocation.

8.3. International Research Visitors

8.3.1. Visits of International Scientists

- Feb. 2012: Leon van der Torre (Pr., University of Luxembourg), collaboration on argumentation systems (2 days)
- Mar. 2012: Meghyn Bienvenu (CR CNRS, IASI/LEO), collaboration on Ontology-Based Data Access (5 days)
- Apr. 2012: Karima Sedki (MdC AgroCampus-Rennes, IRISA), Seminar on "Reasoning with preferences and deciding under uncertainty"
- May. 2012: Safa Yahy (MdC University of Marseille, LSIS), Seminar on "Management of inconsistency with justified argumentative inference"
- Sept. 2012: Bernard Moulin (Universit   Laval, Canada), collaboration on argumentation and dynamic systems (1 month)

- Oct. 2012: Jean-François Condotta (CRIL), collaboration on representation and treatment of inconsistencies (2 days)
- Nov. 2012: Frank van Harmelen (Freie Univ. Amsterdam), seminar on "Reasoning over very, VERY large knowledge bases: towards a web-scale knowledge base of a 100 million facts and beyond"

8.3.1.1. Internships

Patricio Mosse (6 months)

Subject: Argumentation based preference aggregation (cf Ecobiocap in Sect. 8.2)

Institution: University of Buenos Aires (Argentina)

Awa Diattara (6 months)

Subject: Default rules for an agronomy application (cf CTFC in Sect. 7.2)

Institution: University Gaston Berger of Saint-Louis, SÃ©nÃ©gal

8.3.2. Visits to International Teams

- Madalina Croitoru and JÃ©rÃ©me Fortin. Visit to the Department of Computer Science (University of Aberdeen). 5 days in January 2012.
- Souhila Kaci. Visit to Leon van der Torre (University of Luxembourg). January 2012.
- Michaël Thomazo. Visit to KIT (Karlsruhe Institute of Technology). 6 weeks in June/July 2012. Collaboration with Sebastian Rudolph on Ontology-Based Data Access. Funded by DAAD http://paris.daad.de/bourses_de_recherche_de_courte_duree.html.
- Madalina Croitoru. Visit to Srdjan Vesic (University of Luxembourg). 1 week in November 2012. Collaboration on the link between maximal repairs and argumentation extensions
- Jean-François Baget, Marie-Laure Mugnier and Michaël Thomazo. Visit to the Information Systems Group (University of Oxford). 3 days in December 2012. Scientific Exchanges on Existential Rules and Datalog+/-.

MAIA Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. CPER “Informatique Située” project

Participants: Olivier Simonin, François Charpillat, Olivier Rochel, Amandine Dubois, Mihai Andries.

Ye-Qiong Song (Madyne team, LORIA-Inria) is an external collaborator.

The CPER MIS is a Lorraine region and Inria-Feder project. In this context the Informatique Située action aims at studying and experiment AI models for human assistance and intelligent home. We developed an experimental platform called “Smart Apartment”, where we define and study the iTile network (6.2.4.2.1) and different multi-sensors systems for tracking functions. See <http://infositu.loria.fr>.

8.1.2. RNSC project AEGSST

Participant: Vincent Chevrier.

This project “Approche Enactive pour la Gouvernance des Systèmes Socio-Techniques” (AEGSST) is the consequence of the work undertaken within the GEST project funded by the IXXI (“Institut Rhône Alpin des Systèmes Complexes”) and PEPS CNRS project GEST. It is labeled and funded by the Réseau National des Systèmes Complexes (RNSC).

This project aims at a fundamental level at proposing an enactive perspective for the governance issue in case of complex socio-technical systems, like public transportation systems or smart grids in energy domain. From a more applicative perspective, we seek at specifying a participatory and reflexive simulation system based on a multi-agent model.

This project gathers researchers coming from different domains (social cognition, decision theory, simulation, serious game, etc) in order to clarify interdisciplinary issues.

Several meetings were organized and a workshop occurred the 29 th November in Paris.

8.1.3. COMAC

Participants: Mauricio Araya, Marie Tonnelier, Vincent Thomas, Olivier Buffet, François Charpillat.

Laurent Bougrain (CORTEX team, LORIA) is an external collaborator.

The COMAC⁶ project is part of the Materialia competitive cluster. The main objective of the project is to develop diagnosis tools for the low cost identification of defaults in aeronautic parts made of composite materials.

In the MAIA team, our research effort focuses more precisely on information gathering problems involving active sensors, i.e., an intelligent system which has to select the observations to perform (which sensor, where, at which resolution). Mauricio Araya’s undergoing PhD looks precisely at the topic of Active Sensing (Section 6.1.2).

The project has ended in December 2012 and the main contributions of the MAIA and CORTEX teams are (1) the development of the iComac platform that gathers the information concerning the diagnosis procedures results obtained by all the partners (2) the development of Pie Diagnosis System (PDS), a demonstrative application which uses a POMDP approach to compute the optimal active diagnosis strategy, and hypertrees for visualization.

⁶COMAC = *contrôle optimisé multi-techniques des aérostructures composites* / optimized multi-technique control of composite aeronautic parts

8.2. National Initiatives

8.2.1. CNRS PEPH project “IMAVO” (2011-2012)

Participant: Alain Dutech.

IMAVO, for “Interactions entre Modules pour l’Apprentissage dans un environnement VOLatile”, is a PEPH project of the INSB institute of the CNRS. It involves Alain Marchand and Etienne Coutureau from the INCIA Lab of Bordeaux (Behavioral Neurosciences - INSB), Mehdi Khamassi and Benoît Girard from the ISIR Lab of Paris (Robotics and Neurosciences - INS2I), Alain Dutech and Nicolas Rougier from the Loria Lab of Nancy (Computational Neurosciences and Machine Learning - INS2I).

This project investigates *model-based* and *model-free* reinforcement learning approaches for rats learning in volatile environments (*i.e.* context and reward can change during learning). It aims at designing new concept for modularized decision-making systems, allowing a better understanding of the underlying neuro-biological process involved in rats and humans and applications in the field of autonomous robotics.

8.2.2. Inria AEN PAL Personally Assisted Living

Participants: François Charpillet, Olivier Simonin, Mihai Andries.

The PAL project is a national Inria Large Scale Initiative (Action d’Envergure Nationale) involving several teams of the institute (Arobas, Coprin, E-motion, Lagadic, Demar, Maia, Prima, Pulsar and Trio). It is coordinated by David Daney (Inria Sophia-Antipolis EPI Coprin). The project focuses on the study and experiment of models for health and well-being. Maia is particularly involved in the People Surveillance work package, by studying and developing intelligent environments and distributed tracking devices for people walking analysis and robotic assistance (smart tiles, 3D camera network, assistant robots), cf. Sec. 6.2.4.2.1 .

In 2012, we organized a Workshop PAL in Nancy, on November (<http://pal.inria.fr>). The PAL project funded the PhD. thesis of Mihai Andries, who started in october 2012.

8.2.3. PEA-DGA SUSIE 2009-12

Participants: François Charpillet, Olivier Simonin, Romain Mauffray.

This project relies on results and questions arising from the SMAART project (2006-08). During this project we adapted the EVAP algorithm, proposed in the PhD thesis of Arnaud Glad (Maia, 2011) to the patrol with UAVs, while providing a generic digital pheromone based patrolling simulator. Concerning sharing authority, we proposed an original interface to manipulate groups of UAVs.

The SUSIE project allowed to progress on two questions (i) studying and improving parameters of the EVAP algorithm through the SUSIE simulator (ii) defining new ways to manipulate pheromones fields in order to improve the sharing authority.

8.2.4. Inria ADT Percee (2011-13)

Participants: Olivier Simonin, François Charpillet, Olivier Rochel, Nicolas Beaufort.

Percee, for “Perception Distribuée pour Environnements Intelligents”, is a project proposed by Maia and Madynes teams and funded by Inria. This ADT (Action de Développement Technologique) supports our action in the PAL Inria National Scale Initiative (Personally Assisted Living, see 8.2.2).

The project deals with the development and the study of intelligent homes. Since two years we develop an experimental platform, the smart apartment. It allows us to study models and technology for life assistance (walk analysis with iTiles and camera networks, robotic assistants, health diagnostic, domotic functions, wireless communication inside home).

In particular we develop a new tactile floor, which is the iTiles network. Two engineers are funded by the ADT: Moutie Chaider (IJD) and Olivier Rochel (Inria research engineer) for two years.

8.2.5. ANR

8.2.5.1. CART-O-MATIC ANR Carotte

Participants: Olivier Simonin, François Charpillat, Antoine Bautin, Nicolas Beaufort.

This project has been granted by ANR in the Robotics Carotte challenge (Cartographie par ROboT d'un Territoire) from the *Contenus et Interactions* program (2009-2012). The project is funded with ca. 50000 EUR to purchase the robotics platform. The Maia team was also funded with a PhD fellowship (Antoine Bautin, defending his PhD in the beginning of year 2013). The Cartomatic consortium was formed by LISA/Angers University (leader) and Maia/LORIA team (and until 2011 by Wany robotics, Montpellier).

This project concerned the mapping of indoor structured but unknown environments, and the localization of objects, with one or several robots. We explored a decentralized multi-robot approach to achieve the challenge. We demonstrated the efficiency and robustness of the approach by winning the final edition of the contest (June 2012, Bourges). See Section 6.2.4.1.3 and the Web page [Cartomatic project](#).

8.2.5.2. ANR Pherotaxis

Participants: François Charpillat, Olivier Simonin.

Dominique Martinez (Cortex team, Inria NGE) is an external collaborator and the coordinator of the project for Nancy members.

PHEROTAXIS is an "Investissements d'Avenir" ANR 2011-2014 (Coordination: J.-P. Rospars, UMR PISC, INRA Versailles).

The theme of the research is Localisation of odour sources by insects and robots. By associating experimental data with models, the project will allow to define a behavioral model of olfactive processes. This work will also provide several applications, in particular the development of bio-inspired components highly sensitive and selective.

The project is organized in five work packages and involves the PISC research unit (Versailles), Pasteur Institute (Paris) and LORIA/Inria institute (Nancy).

8.2.5.3. ANR project BARQ

Participants: Jörg Hoffmann, Olivier Buffet, Bruno Scherrer.

This project has been granted by ANR in the "Chaires d'Excellence" program. The project is funded with ca. 400000 EUR and will hire four non-permanent researchers (Doctorants and/or Postdocs). Jörg Hoffmann is the project leader, Olivier Buffet and Bruno Scherrer collaborate. Other collaborators from LORIA are Stephan Merz, Ammar Oulamara, and Martin Quinson. The project also has several international collaborators, in particular Prof. Blai Bonet (Universidad Simon Bolivar, Caracas, Venezuela), Prof. Carmel Domshlak (Technion Haifa, Israel), Prof. Hector Geffner (Universitat Pompeu Fabra, Barcelona, Spain), Dr. Malte Helmert (University of Freiburg, Germany), and Prof. Stephen Smith (CMU, Pittsburgh, USA).

The project unites research from four different areas, namely classical planning, probabilistic planning, model checking, and scheduling. The underlying common theme is the development of new methods for computing lower bounds via state aggregation. Specifically, the basic technique investigated allows explicit selection of states to aggregate, in exponentially large state spaces, via an incremental process interleaving it with state space re-construction steps. The two main research questions to be addressed are how to choose the states to aggregate, and how to effectively obtain, in practical scenarios, anytime methods providing solutions with increasingly tighter performance guarantees.

So far, we have hired Dr. Michael Katz as a PostDoc (for 2 years) working on classical planning, and Manel Tagorti as a PhD student (for 3 years) working on probabilistic planning. The Conseil Regional de Lorraine has accepted to co-finance, for 2011, 50% of the the position of Michael Katz for a period of 1 year. Chao-Wen Perng was funded from BARQ for an internship of 5 months during which she worked on her MSc report, laying some basis for the research direction to be followed by Manel Tagorti.

The project has stopped when Joerg Hoffmann left Inria.

8.3. European Initiatives

8.3.1. Collaborations in European Programs, except FP7

Program: InterReg IV B

Project acronym: InTraDE

Project title: Intelligent Transportation for Dynamic Environment

Duration: 2010 - 2014

Coordinator: University of Science and Technology of Lille (Lille 1-LAGIS) (France),

Other partners: South East England Development Agency (United Kingdom), Centre Régional d'Innovation et de Transfert de Technologie – Transport et Logistique (CRITT TL) (France), AG Port of Oostende (AGHO) (Belgium), National Institute for Transport and Logistics, Dublin Institute of Technology (Ireland), Liverpool John Moores University (LOOM) (United Kingdom)

Abstract:

The InTraDE project (Intelligent Transportation for Dynamic Environments, <http://www.intrade-nwe.eu/>) is funded by the European North West Region. The project is coordinated by Rochdi Merzouki from University of Science and Technology of Lille (LAGIS lab.). Other partners are the Maia team, Liverpool John Moores University (LOOM), the National Institute for Transport and Logistics in Dublin Institute of Technology, the South East England Development Agency, the AGHO Port of Oostende and the CRITT in Le Havre. In the context of seaports and maritime terminals, the InTraDE project aims to improve the traffic management and space optimization inside confined spaces by developing a clean and safe intelligent transportation system. This transportation system will operate in parallel with virtual simulation software of the automated site, allowing a robust and real-time supervision of the goods handling operation.

The Maia team partner focuses on decentralized approaches to deal with the control of automated vehicle platooning and the adaptation of the traffic. Maia is funded with two PhD fellowships and one engineer. Both PhD thesis started in the end of 2010. The PhD of Jano Yazbeck, supervised by F. Charpillat and A. Scheuer, aims at studying a “Secure and robust immaterial hanging for automated vehicles”. The PhD of Mohamed Tlig, supervised by O. Simonin and O. Buffet, addresses “Reactive coordination for traffic adaptation in large situated multi-agent systems”.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

- Dr. Iadine Chadès, Research Scientist at CSIRO, Ecosystem Sciences division (Brisbane, Australia), visited MAIA for 1 week in April 2012.
- Pr. Sukanta Das, Professor at the Department of Information Technology, BESU university (West Bengal, India), visited MaIA for three weeks in March 2012.

MOSTRARE Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. *Thèse Inria-Région NPdC (2012-2015)*

Participants: David Chatel, Pascal Denis, Marc Tommasi [correspondent].

Denis and Tommasi supervise the PhD thesis of David Chatel on guided clustering. The PhD is funded by INRIA and the “région Nord - Pas de Calais”.

8.2. National Initiatives

8.2.1. ANR

8.2.1.1. *ANR Lampada (2009-2014)*

Participants: Marc Tommasi [correspondent], Rémi Gilleron, Aurélien Lemay, Fabien Torre, Gemma Garriga.

The Lampada project on “Learning Algorithms, Models and sPArse representations for structured DAta” is coordinated by Tommasi from Mostrare. Our partners are the SEQUEL project of Inria Lille Nord Europe, the LIF (Marseille), the HUBERT CURIEN laboratory (Saint-Etienne), and LIP6 (Paris). More information on the project can be found on <http://lampada.gforge.inria.fr/>.

8.2.1.2. *ANR Defis Codex (2009-2012)*

Participants: Joachim Niehren [correspondent], Sławek Staworko, Aurélien Lemay, Sophie Tison, Anne-Cécile Caron, Jérôme Champavère.

The Codex project on “Efficiency, Dynamicity and Composition for XML Models, Algorithms, and Systems” and is coordinated by Manolescu (GEMO, Inria Saclay). The other partners of Mostrare there are Geneves (WAM, Inria Grenoble), COLAZZO (LRI, Orsay), Castagna (PPS, Paris 7), and Halfeld (Blois). Public information on Codex can be found on <http://codex.saclay.inria.fr/>.

8.2.2. *Competitivity Clusters*

8.2.2.1. *FUI Hermes (2012-2015)*

Joint project in collaboration with many companies (Auchan, KeyneSoft, Cylande, ...). The main objective is to develop a platform for contextual customer relation management. The project started in November 2012.

8.3. European Initiatives

8.3.1. *Collaborations in European Programs, except FP7*

MOSTRARE, in collaboration with SEQUEL and Rouen, is part of the Inria Lille - Nord Europe site for the European Network of Excellence in Pattern Analysis, Statistical Modelling and Computational Learning (PASCAL2).

8.3.2. *Collaborations with Major European Organizations*

Publications [29] and [20] are results of collaborations with the University of Wroclaw and the University of Oxford respectively.

8.4. International Initiatives

8.4.1. Inria International Partners

The ongoing cooperation with our previous international partner at NICTA Sydney has lead to a publication at PODS'2012 [26].

8.5. International Research Visitors

8.5.1. Visits of International Scientists

Jan van den Bussche from the University of Hasselt and Werner Nutt from the University of Bolzano visited Bonifati and Niehren for a recent cooperation.

Fabien Suchanek from the Max-Planck Institute in Saarbrücken visited Bonifati and Niehren and presented his work in the Mostrare seminar.

Yannis Valegrakis from the University of Trento visited Bonifati and presented his work in the Mostrare seminar.

George Fletcher and Toon Calders from the University of Eindhoven visited Bonifati and Staworko and presented their work in the Mostrare seminar.

8.5.1.1. Internships

Carles Creus from the University of Barcelona visited Boiret, Lemay, and Niehren for 4 months for working on tree transducers and compression.

Pavel Labath from the University of Bratislava visited Debarbieux, Sebastian, and Niehren for working on streaming algorithms for XSLT.

8.5.2. Visits to International Teams

Staworko visited Gabriele Papis and Cristian Riverson at the University of Oxford [28].

Niehren visited Mikael Benedikt, Georg Gottlob, and Marta Kwiatkowska at the University of Oxford.

Staworko visited Piotr Wiecek at the University of Warsaw [29].

Groz left for postdoc to the database group of Tova Milo at the University of Haifa in Israel.

OAK Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. DW4RDF

This Digiteo DIM LSC (*Logiciels et Systèmes Complexes*) project has started in October 2011. The aim is to design and implement data warehouse-style models and technologies for RDF data. This project supports the PhD scholarship of A. Roatis.

8.2. National Initiatives

8.2.1. ANR

The ANR Codex project (Coordination, dynamicity and efficiency for XML, 2009-2012) has ended; the final review has taken place in Lyon in January 2012. The project was coordinated by Ioana Manolescu; Nicole Bidoit, Dario Colazzo and François Goasdoué also participated.

The ANR DataBridges project (Data integration for digital cities, 2011-2012) has ended; the final review has taken place in Paris in September 2012. The project was coordinated by Ioana Manolescu; François Goasdoué also participated.

The ANR ConnectedCities project (Clouds for digital cities, 2011-2012) has ended; the final review has taken place in Paris in September 2012. Dario Colazzo, François Goasdoué and Ioana Manolescu have participated to the project.

The ANR DataRing project (Massive data management in peer-to-peer, 2009-2012) has ended; the final review has taken place in Lyon in January 2012. Ioana Manolescu has participated to the project.

8.3. European Initiatives

8.3.1. Collaborations in European Programs, except FP7

Program: KIC EIT ICT Labs

Project acronym: DataBridges

Project title: Data Integration for Digital Cities

Duration: January 2012 - December 2012

Coordinator: Ioana Manolescu

Other partners: Université Paris Sud (France), Technical University of Delft (The Netherlands), DFKI (Germany), Aalto University (Finland), KTH (Sweden), Alcatel-Lucent Bell Labs (France), DataPublica (France)

Abstract: DataBridges work focuses on two main topics: (i) the interoperability, enrichment and personalization of data, e.g. data on the cultural activities within a city, based on user profiles; (ii) efficient techniques for large-scale RDF data management, to be applied (among others) on digital city data.

Program: KIC EIT ICT Labs

Project acronym: Europa

Project title: Efficient cloud-based data management

Duration: January 2012 - December 2012

Coordinator: Volker Markl (Technical Univ. Berlin)

Other partners: Université Paris Sud (France), Technical University of Delft (The Netherlands), DFKI (Germany), Aalto University (Finland), SICS (Sweden)

Abstract: Europa aims at developing techniques for large-scale efficient data management based on a cloud (massively parallel) processing paradigm. Within Europa, we have finalized the Amada platform, and our ongoing work focuses on an algebraic translation framework from XQuery into PACT programs. PACT is the parallel data processing language proposed by the Berlin partner.

8.3.2. Collaborations with Major European Organizations

Partner 1: organisme 1, labo 1 (pays 1)

Sujet 1 (max. 2 lignes)

Partner 2: organisme 2, labo 2 (pays 2)

Sujet 2 (max. 2 lignes)

8.4. International Research Visitors

8.4.1. Visits of International Scientists

We have been visited by:

- Prof. Paolo Atzeni (Università Roma Tré), in June
- Prof. Alin Deutsch (UCSD, USA) in June-July (Digiteo invited scientist)
- Prof. Evi Pitoura (University of Ioannina, Greece), in October
- Prof. Vassilis Christophides (FORTH, Greece) in December
- Prof. Themis Palpanas (University of Trento, Italy) in December
- Prof. Yanlei Diao (U. Massachussets at Amherst, USA) in December

8.4.1.1. Internships

Three students visited the team within the Inria Internship program: Karan Aggaral, Abishek Choudhary and Kuldeep Reddy.

ORPAILLEUR Project-Team

8. Partnerships and Cooperations

8.1. International Initiatives

8.1.1. Participation In International Programs

8.1.1.1. Facepe Inria Project: CM2ID

Participants: Amedeo Napoli [contact person], Chedy Raïssi.

Combining Numerical and Symbolical Methods for the Classification of Multi-valued and Interval Data (CM2ID)

This research project called “Combining Numerical and Symbolical Methods for the Classification of Multi-valued and Interval Data (CM2ID)” involves the Orpailleur Team at Inria NGE, AxIS at Inria Rocquencourt (Yves Lechevallier) and the computer science laboratory of the University of Recife (Prof. Francisco de A.T. de Carvalho). The project aims at developing and comparing classification and 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, 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.

8.1.1.2. Fapemig Inria Project: IKMSDM

Participants: Amedeo Napoli [contact person], Chedy Raïssi.

This Fapemig – Inria research project, called “Incorporating knowledge models into scalable data mining algorithms” involves researchers at Universidade Federal de Minas Gerais in Belo Horizonte –a group led by Prof. Wagner Meira– and the Orpailleur team at Inria Nancy Grand Est. In this project we are interested in the mining of large amount of data and we target two relevant application scenarios where such issue may be observed. The first one is text mining, i.e. extracting knowledge from texts and document categorization. The second application scenario is graph mining, i.e. determining relationship-based patterns and use these relations to perform classification tasks. In both cases, the computational complexity is large either because the high dimensionality of the data or the complexity of the patterns to be mined.

One strategy to ease the execution of such data mining tasks is to use existing knowledge to restrict the search space and to assess the quality of the patterns found. This existing knowledge may be formalized in ontologies but also in other ways whose study is a research issue in this project. Once we are able to build knowledge models, we need to determine how to use such knowledge models, which is a second major research issue in this project. In particular, we want to design and evaluate mechanisms that allow the exploitation of existing knowledge for sake of improving data mining algorithms.

Finally, the computational complexity of the algorithms remains a major issue and we intend to address it through parallel algorithms. Data mining algorithms, in general, represent a challenge for sake of parallelization because they are irregular and intensive in terms of both computing and communication. Accordingly, in a first joint work, we developed a new parallel algorithm to build skycubes based on the Anthill framework developed at UFMG. The paper was presented in a local Brazilian Conference and an extended journal version will appear in a 2012 special issue of the International Journal of Parallel Programming.

8.1.1.3. International collaborations in Mining complex data

Participants: Mehwish Alam, Aleksey Buzmakov, Victor Codocedo, Adrien Coulet, Elias Egho, Ioanna Lykourantzou, Amedeo Napoli [contact person], Chedy Raïssi.

8.1.1.3.1. PICS CNRS CADOE

A first collaboration involves “Université du Québec à Montréal” (UQAM) in Montréal with Prof. Petko Valtchev and Laboratoire LIRMM in Montpellier with Prof. Marianne Huchard. This collaboration is supported by a CNRS PICS project (2011-2014), which is called “Concept Analysis driving Ontology Engineering” and abbreviated in “CAoE”. The research work within this project is aimed at defining and implementing a semi-automatic methodology supporting ontology engineering based on the joint use of Formal Concept Analysis (FCA) and Relational Concept Analysis (RCA). At the moment, some elements of this methodology are existing and were used in text mining [86], [85], but this methodology should be completed and improved, especially regarding the applicability on complex data and the interoperability with knowledge representation modules.

8.1.1.3.2. Collaboration with HSE Moscow

A second collaboration involves Sergei Kusnetsov at Higher School of Economics in Moscow (HSE). Amedeo Napoli visited HSE laboratory in November 2012 (with the support of HSE) and Sergei Kuznetsov visited Inria NGE in August and in December 2012. These visits were the occasion of preparing a publications (submitted for the next year). This shows that the collaboration is on-going and that there is still a substantial research work to be done.

8.1.1.3.3. AGAUR Project: collaboration with UPC Barcelona

This project mainly involves Amedeo Napoli and Jaume Baixeries who is an Associate Professor at UPC Barcelona (Universitat Politècnica de Catalunya). Amedeo Napoli had a stay of roughly two months in December 2011 and May-June 2012. Both researchers have worked, jointly with Mehdi Kaytoue, on the characterization of functional dependencies in many-valued data with FCA and pattern structures. In this work, functional dependencies are directly taken into account and this shows a different but important capability of pattern structures to deal with complex data [30].

8.1.1.3.4. PHC Zenon (Cyprus)

A third collaboration –a PHC Zenon project– exists with Florent Domenach, associated professor at the University of Nicosia in Cyprus. This project is entitled “Knowledge Discovery for Complex Data in Formal and Relational Concept Analysis” (KD4CD) and is aimed at studying and combining different types of classification process in the framework of FCA. These processes can be based on Galois connections but also on the so-called “overhangings”, i.e. a kind of generalization of closure systems. Moreover, another interest is put on consensus theory where the objective is to find the better classification of a set of objects according to a quality measure (this could be applied to ontologies). This year, there were two visits, one from Cyprus to France in October 2012 and the other from France to Cyprus in December 2012. Publications are currently submitted.

8.2. European Initiatives

8.2.1. FP7 Project DOVSA

DOVSA stands for “Development of Virtual Screening Algorithms: Exploring Multiple Ligand Binding Modes Using Spherical Harmonic Consensus Clustering”. It is a European project (Type PEOPLE) funded as a “Marie Curie Intra-European Fellowships for Career Development (IEF)” from July 2010 until July 2012. The coordinator of the project is Inria NGE.

This project is aimed at advancing the state of the art in virtual drug screening by developing novel spherical harmonic-based consensus clustering algorithms. The main disease that will be targeted in this project is the acquired immune deficiency syndrome (AIDS), caused by the human immuno-deficiency virus (HIV). However, the approach will be quite generic and will be broadly applicable to many other diseases. The approach will be tested and validated using 40 well-known drug targets from the DUD dataset. It will then be used to screen the French Chimiothèque Nationale library of some 36000 compounds for novel ligands which will bind the CCR5 co-receptor and hence block HIV infection. A small list of candidate entry-blocking compounds will be sent to Barcelona for experimental testing. By extending the SH-based consensus clustering technique, this project will provide a generic tool to help deal with cases where multiple ligands may be associated with multiple pocket sub-sites or which may bind multiple targets, and it will help to find new HIV entry-blocking compounds.

8.3. National Initiatives

8.3.1. ANR

8.3.1.1. ANR Hybride

Participants: Luis Felipe Melo, Amedeo Napoli, Chedy Raïssi, My Thao Tang, Yannick Toussaint [contact person].

The Hybride research project aims at developing new methods and tools for supporting knowledge discovery from textual data by combining methods from Natural Language Processing (NLP) and Knowledge Discovery in Databases (KDD). A key idea is to design an interacting and convergent process where NLP methods are used for guiding text mining and KDD methods are used for analyzing textual documents. NLP methods are mainly based on text analysis, and extraction of general and temporal information, while KDD methods are based on pattern mining, e.g. itemsets and sequences, formal concept analysis and variations, and graph mining. In this way, NLP methods applied to some texts locate “textual information” that can be used by KDD methods as constraints for focusing the mining of textual data. By contrast, KDD methods can extract itemsets or sequences that can be used for guiding information extraction from texts and text analysis. This combination of NLP and KDD methods for common objectives, can be viewed as a continuous process, based on a sequence of complex operations from NLP and KDD that reinforces itself through a feedback loop. Experimental and validation parts associated with the Hybride project are provided by an application to the documentation of rare diseases in the context of Orphanet.

The fundamental aspects of the Hybride project can be understood through the main steps of the knowledge discovery loop with a NLP/KDD perspective : (i) data preparation, (ii) data mining, (iii) interpretation and validation of the results, (iv) knowledge construction. At each step, new methods have to be designed for achieving this interrelated NLP/KDD loop. One of the outcomes of the project should be a system integrating the operations involved within the whole NLP/KDD loop, in the context of Orphanet for text analysis and production of new documentation on rare diseases. The implementation of such a system combines various interrelated aspects, namely natural language processing, knowledge discovery, data mining, and knowledge engineering. This original combination still remains a challenge in computer science.

The partners of the Hybride consortium are the GREYC Caen laboratory (pattern mining, NLP, text mining), the MoDyCo Paris laboratory (NLP, linguistics), the INSERM Paris laboratory (Orphanet, ontology design), and Inria NGE (FCA, knowledge representation, pattern mining, text mining).

8.3.1.2. ANR Kolflow

Participants: Jean Lieber [contact person], Amedeo Napoli, Emmanuel Nauer, Julien Stévenot, My Thao Tang, Yannick Toussaint.

Kolflow (<http://kolflow.univ-nantes.fr/>) is a 3-years basic research project taking place from February 2011 to July 2014, funded by French National Agency for Research (ANR), program ANR CONTINT. The aim of the project is investigation on man-machine collaboration in continuous knowledge-construction flows. Kolflow partners are GDD (LINA Nantes), Silex (LIRIS Lyon), Orpailleur, Score (LORIA), and Wimmics (Inria Sophia Antipolis).

8.3.1.3. ANR PEPSI: Polynomial Expansions of Protein Structures and Interactions

Participants: Dave Ritchie, Marie-Dominique Devignes, Malika Smail-Tabbone.

The PEPSI (“Polynomial Expansions of Protein Structures and Interactions”) project is a collaboration with Sergei Grudinin at Inria Grenoble (project Nano-D) and Valentin Gordeliy at the Institut de Biologie Structurale (IBS) in Grenoble. This four-year project funded by the ANR Modèles Numériques programme involves developing computational protein modeling and docking techniques and using them to help solve the structures of large molecular systems experimentally (<http://pepsi.gforge.inria.fr>).

8.3.1.4. ANR Trajcan: a study of patient care trajectories

Participants: Elias Egho, Nicolas Jay [contact person], Amedeo Napoli, Chedy Raïssi.

Since 30 years, many patient classification systems (PCS) have been developed. These systems aim at classifying care episodes into groups according to different patient characteristics. In France, the so-called “Programme de Médicalisation des Systèmes d’Information” (PMSI) is a national wide PCS in use in every hospital. It systematically collects data about millions of hospitalizations. Though it is used for funding purposes, it includes useful knowledge for other public health domains such as epidemiology or health care planning.

The objective of the Trajcan project is to represent and analyze “patient care trajectories” (patient suffering from cancer limited to breast, colon, rectum, and lung cancers) and the associated healthcare. The data are related to patients receiving hospital cares in the “Bourgogne” region and using data from the PMSI. Such an analysis involves various data, e.g. type of cancer, number of visits, type of stays, hospitalization services and therapies used, and demographic factors, i.e. age, gender, place of residence.

One thesis is currently carried out on this subject whose objective is to design a knowledge discovery system working on multidimensional and sequential data for characterizing Patient Care Trajectories (PCT). This thesis combines knowledge discovery and knowledge representation methods for improving the definition of patient care trajectories as temporal objects (sequential data mining). The overall objective is to provide in decision support for improving healthcare in detecting for example typical or exceptional trajectories for planning with precision healthcare for a given population. In order to discover groups of patients showing similar health condition, treatments or journeys through the healthcare system, PCT are modeled as multilevel and multidimensional sequences of itemsets, using external knowledge on hospitals, medical procedures and diagnoses. Accordingly, a new algorithm [42] has been developed to mine sequential patterns.

8.3.2. Other National Initiatives and Collaborations

8.3.2.1. PEPS Cryo-CA

Participant: Dave Ritchie [Inria Nancy].

Cryo-CA is a two-year PEPS project (Projets exploratoires pluridisciplinaires) funded by CNRS, involving a collaboration with cryo-electron microscopy experimentalists at the IGBMC (Institut de Génétique et de Biologie Moléculaire et Cellulaire) in Strasbourg. People involved in the project with Dave Ritchie are Sergei Grudinin (Inria Grenoble), Annick Dejaegere (IGBMC, Strasbourg), and Patrick Schultz (IGBMC Strasbourg). The aim of the project is to encourage collaborations between experimentalists and computer scientists in order to advance the state of the art of computational algorithms in structural biology. In November 2012, a workshop funded by this project attracted some 60 participants (<http://ccsb2012.loria.fr>).

8.3.2.2. Towards the discovery of new nonribosomal peptides and synthetases

We have initiated a collaboration with researchers from the LIFL and Université Lille Nord de France. We collaborate on the NRPS toolbox [57]. Data was cleaned and integrated from various public and specific analysis programs. The resulting database should facilitate the process of knowledge discovery of new nonribosomal peptides and synthetases.

8.4. Regional Initiatives

8.4.1. BioProLor

The Orpailleur team is member of the BioProLor consortium composed of 5 enterprises and 7 academic research teams. This consortium is funded for 2 years (2010-2012) by the AME (“Agence pour la Mobilisation Economique”). The objective of BioProLor is the design of a production filière for compounds with high added-value which originate from plants in Lorraine. The Orpailleur team and the associated start-up “Harmonic Pharma” are in charge of the computational aspects of this research work.

In addition, a CIFRE contract (2009-2012) was set up with Harmonic Pharma for funding the thesis of Emmanuel Bresso on the following subject: “Organisation et exploitation des connaissances sur les réseaux d’interactions biomoléculaires pour l’identification de gènes candidats et la caractérisation de profils d’effets secondaires de principes actifs”.

8.4.2. Contrat Plan État Région” (CPER)

The links between the Regional Administration and LORIA are materialized through an administrative contract called “Contrat Plan État Région” (CPER) running from 2007 to 2013. The associated scientific program is called “Modélisations, informations et systèmes numériques” (MISN) and includes two tracks in which the Orpailleur team is involved.

- “Modeling Bio-molecules and their Interactions” (MBI).

This project is coordinated by Marie-Dominique Devignes (<http://bioinfo.loria.fr>) and the general objective is to study how domain knowledge can be taken into account for improving modeling of biomolecules and their interactions, and how, in sequence, this guides the modeling of biological systems. Six scientific projects are currently under development and involve collaborations with computer scientists, and people working either in biology or chemistry.

An Inria experimental research platform is currently developed in the framework of MBI (<http://bioinfo.loria.fr/Plateforme%20MBI>). This platform is aimed at sharing data and computing resources. Its specific features are relative to biomolecules modeling, classification, and to data integration for data mining. In parallel with the bioinformatics platforms in Strasbourg, Reims, Lille, and Nancy-INIST, it constitutes the North-East node of RENABI (“Réseau National des Plateformes Bioinformatiques”).

- “Traitement Automatique des Langues et des Connaissances” (TALC).

TALC stands for “Automatic Processing of Languages and Knowledge”. The general objective is to study the relations existing between knowledge discovery, knowledge representation, reasoning, and natural language processing. In this framework, the Orpailleur team plays an important role as the research themes are closely related to those of the team. Actually, research projects are currently under development on knowledge management and decision support in the large involving in particular the Kasimir and the Taaable systems.

SMIS Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR DEMOTIS (Feb. 2009 - Feb. 2012)

Partners: SopinSpace (coordinator), Inria (SMIS, SECRET), CECOGLI

SMIS funding: 85k€

<http://www.demotis.org/>

The design and implementation of large-scale infrastructure for sensitive and critical data (e.g., electronic health records) have to face a tangle of legal provisions, technical standards, and societal concerns and expectations. DEMOTIS project aims to understand how the intrication between legal and technical domains constrains the design of such data infrastructures. DEMOTIS consists of two interdependent facets: legal (health law, privacy law, intellectual property law) and computer science (database security, cryptographic techniques). Combining expertise of researchers in Law and computer scientists should help to better assess whether law statements can be actually put in practice, to characterize the related technological challenges when mismatches are detected and, when possible, to suggest preliminary solutions.

8.1.2. ANR KISS (Dec. 2011 - Dec. 2015)

Partners: Inria-SMIS (coordinator), Inria-SECRET, LIRIS, Univ. of Versailles, CryptoExperts, Gemalto, Yvelines district

SMIS funding: 230k€

The idea promoted in KISS is to embed, in trusted devices, software components capable of acquiring, storing and managing securely various forms of personal data (e.g., salary forms, invoices, banking statements, geolocation data, depending on the applications). These software components form a Personal Data Server which can remain under the holder's control. The scientific challenges include: embedded data management issues tackling regular, streaming and spatio-temporal data (e.g., geolocation data), data provenance-based privacy models, crypto-protected distributed protocols to implement private communications and secure global computations.

8.1.3. ARC CAPPRIS (Dec. 2011 - Dec. 2015)

Inria Large Scale Initiative

Inria Partners: PRIVATICS (coordinator), SMIS, PLANETE, CIDRe, COMETE

External partners: Univ. of Namur, Eurecom, LAAS

Funding: not associated to individual project-teams

An ARC is a long-term multi-disciplinary project launched by Inria to sustain large scale risky research actions in line with its own strategic plan. CAPPRIS stands for "Collaborative Action on the Protection of Privacy Rights in the Information Society". The key issues that will be addressed are: (1) the identification of existing and future threats to privacy, (2) the definition of formally grounded measures to assess and quantify privacy, (3) the definition of the fundamental principles underlying privacy by design and methods to apply them in concrete situations and (4) The integration of the social and legal dimensions. To assess the relevance and significance of the research results, they will be confronted to three classes of case studies CAPPRIS partners are involved in, namely Online Social Networks, Location Based Services and Electronic Health Record Systems.

8.2. European Initiatives

8.2.1. Collaborations in European Programs, except FP7

Program: Danish Council for Independent Research (FTP call)

Project acronym: CLyDE

Project title: Cross-LaYer optimized Database Engine

Duration: 10/2011 - 10/2014

Coordinator: Philippe Bonnet (ITU of Copenhagen)

Other partners: IT University of Copenhagen - Denmark, SMIS

Abstract: The goal is to explore how flash devices, operating system and database system can be designed together to improve overall performance. Such a co-design is particularly important for the next generation database appliances, or cloud-based relational database systems for which well-suited flash components must be specified. More generally, our goal is to influence the evolution of flash devices and commodity database systems for the benefit of data intensive applications. The project should result in two complementary open-source software systems: (i) a bimodal flash device software component based on the idea from [6], and (ii) a database system optimized for bimodal flash devices. The project funding will be managed by the IT University of Copenhagen and will cover the expenses for two co-supervised PhD students (including regular visits to and from Denmark).

8.2.2. Collaborations with Major European Organizations

The SMIS members have developed tight european cooperations with the following persons/teams:

- P. Bonnet (Associate Professor at the University of Copenhagen, Denmark): collaboration on Flash-based data management for high-end servers. The study of flash devices started during a short sabbatical of Luc Bouganim (from April to August 2008) in Copenhagen. The uFLIP study has been conducted in close cooperation with Philippe Bonnet from IT University of Copenhagen and Björn Þór Jónsson from Reykjavík University. The cooperation with Copenhagen is very active and led to new studies on flash devices and on the Trusted Cell architecture Two PhD students are currently co-supervised by Luc Bouganim and Philippe Bonnet. Philippe Bonnet got a Marie-Curie IEF grant and will visit SMIS for one year in 2013-2014.
- Michalis Vazirgiannis (Athens University of Economics and Business): collaboration on Minimal Exposure in the context of Michalis' Digiteo Chair at LIX (Ecole Polytechnique).

8.3. International Initiatives

8.3.1. Inria International Partners

The SMIS members have developed tight international cooperations with the following persons/teams:

- Dennis Shasha (Professor at the University of New-York, USA): collaboration on tamper-resistant data management issues. Dennis Shasha has done a one year sabbatical stay in SMIS (July 2006 to June 2007).
- I. Ray and I.Ray (Professors at Colorado State University, USA): collaboration on data privacy and usage control (Indrajit and Indrakshi Ray have visited SMIS from September 2009 up to February 2010).
- Cristian Borcea (Associate Professor at New Jersey Institute of Technology, USA): collaboration on spatio-temporal data management issues.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

8.4.1.1. Internships

- Quoc-Cong To (Vietnam): Internship on distributed query processing in the PDS architecture. September 2012 - February 2013.
- Athanasia Katsouraki (Greece): Internship on usage control models. January-September 2012.
- Danae Boutara (Greece): Internship on Minimal exposure. April-August 2012.

WAM Project-Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. Investissements d'avenir

CLAIRE

Title: Community Learning through Adaptive and Interactive multichannel Resources for Education

Call: Technologies for e-education

Duration: March 2012 - February 2014

Coordinator: [SimpleIT](#)

Others partners: LIRIS

See also: <http://www.projet-claire.fr/>

Abstract: Project CLAIRE aims at developing an open-source tool for collaborative authoring in an e-learning environment (Learning Content Management System), targeting teachers and students in high-school and universities. Its innovative features include:

- a platform for collaborative structured editing of rich media and semantic content, e.g.: tools for generating interactive evaluation tests
- processes for continuous enhancement of content, e.g.: social annotation, behavior analysis, accessible multi-support publishing (web, PDF, ODT, LaTeX, smartphones, tablets).

7.1.2. ANR

Codex

Title: Efficiency, Dynamicity and Composition for XML: Models, Algorithms, and Systems

Call: Emerging Domains program (DEFIS)

Duration: March 2009 - June 2012

Coordinator: Inria Saclay-Île-de-France

Others partners: Inria Lille-Nord-Europe (MOSTRARE), University Paris Sud, Sorbonne - University Paris 7 (PPS), Centre universitaire de Blois (LI - Université F. Rabelais Tours), Innovimax SARL.

See also: <http://codex.saclay.inria.fr/>

Abstract: Codex seeks to push the frontier of XML technology innovation in three interconnected directions.

- Languages and algorithms: prototypes are developed for efficient and expressive XML processing, in particular advancing towards massively distributed XML repositories.
- Codex considers models for describing, controlling, and reacting to the dynamic behavior of XML corpora and XML schemas with time.
- The project proposes theories, models and prototypes for composing XML programs for richer interactions, and XML schemas into rich, expressive, yet formally grounded type descriptions.

Typex

Title: Typeful certified XML: integrating language, logic, and data-oriented best practices

Call: Programme Blanc

Duration: January 2012 - December 2014

Coordinator: PPS (CNRS - Paris 7 Diderot)

Others partners: LRI (Orsay)

See also: <http://typex.lri.fr>

Abstract: The highly ambitious and final goal of this project is to produce a new generation of XML programming languages stemming from the synergy of integrating three approaches into a unique framework:

- a logical approach based on solvers
- a programming language approach
- a data-oriented approach

7.1.3. Competitivity Clusters**Autonomy**

Title: High-tech to serve people with disabilities

Call: Global competitiveness cluster Minalogic, 6th call for R&D projects

Duration: March 2010 - June 2012

Coordinator: ST Microelectronics

Others partners: ST-Ericsson, Raisonance, Grenoble University, IVèS

See also: <http://autonomie.minalogic.net/>

Abstract: The goal of the project is to develop high-tech tools to improve autonomy for people with disabilities. These tools are integrated in mobile devices such as cell phones or special-purpose devices, to improve the quality of life of people with disabilities. These devices access remote dedicated services to help geolocation and guiding. They take advantage of the latest advances in embedded systems: cameras, audio, video, compass, accelerometer, gyroscope. Two major application areas are addressed: software tools on cell phones for sight disabled people, and guiding and information tools for moving around in a city.

7.2. European Initiatives**7.2.1. FP7 Projects****7.2.1.1. VENTURI**

Title: immersiVe ENhancemenT of User-woRld Interactions

Type: Cooperation (ICT)

Call: FP7-ICT-20111.5 Networked Media and Search Systems

Instrument: Specific Targeted Research Project (STREP)

Duration: October 2011 - September 2014

Coordinator: Fondazione Bruno Kessler (Italy)

Others partners: Fraunhofer Heinrich Hertz Institute (Germany), ST Microelectronics (Italy), ST-Ericsson (France), Metaio (Germany), e-Diam Interactive (Spain), Sony-Ericsson (Sweden)

See also: <https://venturi.fbk.eu/>

Abstract: Venturi aims to create a pervasive Augmented Reality paradigm, where available information will be presented in a user- rather than device-specific way. The goal is to create an experience that is always present whilst never obstructing. Venturi will exploit, optimize and extend current and next generation mobile platforms; verifying platform and QoE performance through life-enriching use cases and applications to ensure device-to-user continuity.

7.2.2. Collaborations with Major European Organizations

EPFL, MEDIA group (Switzerland)

We have been working jointly for years on XML editing, more specifically on the template-driven approach. This collaboration was recently extended to XML processing [2].

WIMMICS Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

Nhan Le Thanh is animator of a multidisciplinary working group (PSP) on personalized eHealth in the Alpes-Maritimes department.

8.2. National Initiatives

8.2.1. 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>

8.2.2. 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>

8.2.3. 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 efficient. 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>

8.2.4. ANR OCKTOPUS

This new ANR project is starting in December 2012. 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.

We believe that this approach will maximize the scientific, economic and social impact of OCKTOPUS by giving high visibility to the research results produced by our academic partners, and by providing a direct route to transfer these results to the internet marketplace through Alcméon's commercial products.

Partners: Alcméon, CRG, Inria Wimmics.

Web site: <http://ocktopus.alcmeon.com>

8.2.5. CNRS Mastodons CrEDIBLE

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 [33], [63], [64].

Web site: <https://credible.i3s.unice.fr>

8.2.6. Inria Large scale initiative action PAL

Wimmics entered this year the Inria large scale initiative Personal Assistant Living (PAL), devoted to the assistance to elderly and fragile people. Our contribution in PAL is described in section 6.16.2 .

Web site: <http://pal.inria.fr>

8.2.7. Follow up: GDR I3I

In the continuation of a specific action (AS) *Interopérabilité des Systèmes d'Information et Ingénierie des Modèles*, funded by GDR I3I in 2011, C. Faron-Zucker worked in 2012 on a synthesis work on the contributions of model driven engineering to the interoperability of information systems [45]. She was specially involved on model and data integration issues which can also be found in the CrEDIBLE project.

8.3. International Initiatives

8.3.1. Participation In International Programs

LIRIMA, Senegal

The Wimmics team participates to the LIRIMA ²⁵.

We have a collaboration with Moussa Lo, Computer Science department of university Gaston Berger at Saint-Louis in Senegal. We participate to a AUF funded project: *Social Semantic Web Platform for Knowledge Sharing in West-africa Communities*

U. of Annaba, Algeria

Catherine Faron-Zucker is responsible in France of a scientific collaboration project with the LabGed laboratory of university of Annaba funded by CNRS and DPGRF (Algeria). This project aims to study the personalization and socialization of ubiquitous e-learning systems based on Semantic Web models and techniques. In this framework, she co-supervise with Algerian colleague Hassina Seridi two PhD students at LabGed.

²⁵<http://www.lirima.uninet.cm/>

In 2012, Khaled Halimi continued the development of a personal learning system with the aim of providing for each user a personal space according to his/her profile, providing intelligent recommendations based on the analysis of the user's interactions, relations and activities, recommending to students the best learning paths according to the recommendation of the best collaborators and the best learning resources, making all users aware of what happens in the system.

Samia Beldjoudi is working on the personalization of resource recommendations based on the analysis of tag-based user profiles; in 2012 she focused on social interactions between the folksonomy's members in order to extract the meaning of terms and overcome the problems of tags' ambiguity and spelling variations [25].

8.4. International Research Visitors

8.4.1. Visits of International Scientists

8.4.1.1. Internships

Eric Toguem (October 8th to November 27th)

Subject: *Distributed LOD*

Institution: *University Yahoundé (Cameroun)*

Fatou Kamara (November 5th to 15th)

Subject: *Semantic Distance*

Institution: *University Gaston Berger (Saint-Louis, Senegal)*

ZENITH Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. Labex NUMEV, Montpellier

URL: <http://www2.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.

8.1.3. ModSiCS2020 Working Group, Montpellier

The ModSiCS2020 (Modeling and Simulation of Complex Systems in 2020) working group was set up by UM2 to analyze the local situation (forces and weaknesses, current projects), identify the critical research directions and propose concrete actions in terms of research projects, equipment facilities, human resources and training to be encouraged in Montpellier. The group was headed by Patrick Valduriez and gathered a small number of experts in different disciplines (agronomy, bioinformatics, computer science, environmental science, life science, etc.). The conclusions of the group [57] were presented at the ModSiCS2020 workshop on Data, Models and Theories for Complex Systems: new challenges and opportunities, organized by UM2 in march. Following the work of the group, a “Groupement d’Intérêt Scientifique (GIS)” is being proposed in Montpellier.

8.2. National Initiatives

8.2.1. ANR

8.2.1.1. VERSO DataRing(2008-2012, 300Keuros)

Participants: Reza Akbarinia, Zohra Bellahsène, Emmanuel Castanier, Duy Hoa Ngo, Esther Pacitti, Didier Parigot, Guillaume Verger, Patrick Valduriez [leader].

URL: <http://www-sop.inria.fr/teams/zenith/dataring>

The DataRing project, headed by P. Valduriez, involves the Leo project-team (Inria Saclay Ile de France), LIG, LIRMM and Telecom ParisTech. The objective is to address the problem of data sharing for online communities, such as social networks (e.g. sites like MySpace and Facebook) and professional communities (e.g. research communities, online technical support groups) which are becoming a major killer application of the web. The project addresses this problem by organizing community members in a peer-to-peer (P2P) network ring across distributed data source owners where each member can share data with the others through a P2P overlay network. In this project, we study the following problems: schema matching, query processing with data uncertainty, data indexing and caching, data privacy and trust. To validate our approach, we develop services based on our prototypes WebSmatch, SON, P2Prec and ProbDB.

8.2.1.2. 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. Others

8.2.2.1. RTRA Pl@ntNet (2009-2013), 1Meuros

Participants: Alexis Joly, Hervé Goëau, 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 ³, IMEDIA project team at Inria, and the French botanical network TelaBotanica ⁴), 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.

8.2.2.2. CIFRE INA/Inria (2011-2013), 100Keuros

Participants: Alexis Joly, Pierre Letessier.

This CIFRE contract with INA funds a 3-years PhD (Pierre Letessier) to address research challenges related to content-based mining of visual objects in large collections.

8.2.2.3. CNRS INS2I Mastodons (2012), 30Keuros

Participants: Florent Masegla, Patrick Valduriez, Esther Pacitti [leader].

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

Program: FP7

Project acronym: CHORUS+ (avmediasearch.eu)

Project title: European coordination action on Audio-Visual Media Search

Duration: 2010 - 2012

Coordinator: JCP consulting

³<http://amap.cirad.fr/en/>

⁴<http://www.tela-botanica.org/>

Other partners: CERTH-ITI (Greece), University of Trento (Italy), HES-SO (Switzerland), Technicolor (France), Vienna University of Technology (Austria), Engineering Ingegneria Informatica SPA (Italy), JRC Institute for Prospective Technological Studies (EU)

Abstract: CHORUS+ <http://avmediasearch.eu/> objective is to coordinate national and international projects and initiatives in the Search-engine domain and to extend this Coordination in non-European countries. ZENITH actively participated to this action, Alexis Joly being member of the steering committee and leader of a work package. We particularly promoted scientific data as an essential challenge to be addressed by this community through the co-organization of international events (CBMI 2012 panel, ImageCLEF 2012, international workshop on search computing) and discussions with leaders of European projects belonging to the cluster of the coordination action. Besides, we did work on technology transfer issues and the potential of benchmarking campaigns as a tool to foster it (conduction of a survey of about hundred people from both academy and industry, organization of a think-tank with about 20 stakeholders, writing of a recommendation report for the EU commission).

8.4. International Initiatives

8.4.1. Inria International Partners

We have regular scientific relationships with research laboratories in

- North America: Univ. of Waterloo (Tamer Özsu), Univ. of California, Santa Barbara (Divy Agrawal, Amr El Abbadi).
- 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 Lluís Larriba Pey, Victor Muñoz)

8.4.2. Participation In International Programs

We are involved in the following international actions:

- CNPq-Inria project DatLuge (Data & Task Management in Large Scale, 2009-2012) with UFRJ (Marta Mattoso, Vanessa Braganholo, Alexandre Lima), LNCC, Rio de Janeiro (Fabio Porto), and UFPR, Curitiba (Eduardo Almeida) to work on large scale scientific workflows;
- 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;
- EGIDE Osmoze project SECC (Services for Curricula Comparison, 2011-2012), with Riga Technical University (Janis Grundspenkis, Marité Kirikova) to work on automatic analysis and mapping of conceptual trees and maps acquired from digital documents.

8.5. International Research Visitors

8.5.1. Visits of International Scientists

Prof. Jens Dittrich (Univ. Saarland, Germany) gave a seminar at LIRMM on data management with MapReduce.

Prof. Marta Mattoso (UFRJ, Rio de Janeiro) gave a seminar at LIRMM in the context of IBC on data provenance in scientific workflows.

8.5.2. Visits to International Teams

Esther Pacitti and Patrick Valduriez were invited researchers at the National University of Singapore in July.

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 (6.3.1), 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 robots⁵. We are especially involved in the calibration of a prototype developed by LIRMM and TECNALIA, see section 6.2.1.2.

8.2. European Initiatives

8.2.1. FP7 Projects

Participants: Laurent Blanchet, David Daney, Jean-Pierre Merlet [correspondant], Odile Pourtallier, Yves Papegay.

Program: FP7-2011-NMP-ICT-FoF, Factory of the Future

Project acronym: CableBot

Project title: Parallel Cable Robotics for Improving Maintenance and Logistics of Large-Scale Products

Duration: December 2011- December 2014

Coordinator: Tecnalía

Other partners: LIRMM (France), FRAUNHOFER-IPA (Germany), Duisburg-Essen University (Germany), EADS (France), ACCIONA (Spain), VICINAY (Spain)

Abstract: The CableBOT project 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.

⁵<http://www2.lirmm.fr/cogiro/>

E-MOTION Project-Team (section vide)

FLOWERS Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. ADT CARRoMan

The ADT project CARRoMan started in november 2012 (recruitment of Antoine Hoarau). Autonomous human-centered robots, for instance robots that assist people with disabilities, must be able to physically manipulate their environment. There is therefore a strong interest within the FLOWERS team to apply the developmental approach to robotics in particular to the acquisition of sophisticated skills for manipulation and perception. ENSTA-ParisTech has recently acquired a Meka humanoid robot dedicated to human-robot interaction, and which is perfectly fitted to this research. The goal of this ADT is to install state-of-the-art software architecture and libraries for perception and control on the Meka robot, so that this robot can be jointly used by FLOWERS and ENSTA. In particular, we want to provide the robot with an initial set of manipulation skills. The engineer will develop a set of demos, which demonstrate the capabilities of the Meka, and provide a basis on which researchers can base their experiments.

8.1.2. CRA ARAUI

A Conseil Régional d'Aquitaine Project (ARAUI, 2011-) began, coordinated by Manuel Lopes entitled *Apprentissage Automatique en Robotique pour l'Adaptation aux Utilisateurs a Travers L'Interaction*. It will fund 50% of a 3 years PhD student and funding of 5500 euros for equipment.

The objective of ARAUI is the creation of robots that initiate autonomously the execution of frequent tasks after learning about the user's preferences through repeated interactions. Particularly these robots will act as personal companions or helpers and will be able to perform shared tasks with humans.

The long-term view of this project is that of a robot that comes out of the box with general purpose motor and sensory skills and then is adapted to each user's preferences and needs to achieve autonomous behavior. The major challenge is how to equip machines with such adaptability and learning capabilities. Until now machines are programmed by skilled engineers to perform a specific task and learning new tasks is not possible. Even in a restricted industrial setting the need for robots that can be more easily re-programmed to new tasks and environments has lead to research programs on flexible manufacturing that consider frequent changes in tasks and close (physical) interactions with human operators.

8.1.3. CRA ACROBATE

The Conseil Régional d'Aquitaine Project (ACROBATE, 2009-) continued, involving Thomas Cederborg and Pierre-Yves Oudeyer. The funding contributes with 50% funding for a 3 years PhD student. The objective of ACROBATE is to study mechanisms and models that can allow a robot to learn in a unified manner context-dependant motor skills and linguistic skills through interactions with humans.

8.1.4. ADT Acrodev

The ADT project (Acrodev, 2010-) continued, involving Paul Fudal, Haylee Fogg, Olivier Ly and Pierre-Yves Oudeyer. The Inria ADT funds two engineers for two years. The objective of Acrodev is on the one hand to build up re-usable software architectures for embedded control of Acroban-like robots, and on the other hand to explore novel morphologies in particular for the feet, hands and head of Acroban-like robots.

8.1.5. Collaboration with Labri/Unvi. Bordeaux I

We continued to collaborate with the Rhoban group at Labri/CNRS/Univ. Bordeaux I, and in particular Olivier Ly and Hugo Gimbert, about the design of bio-inspired compliant robotic morphologies, such as around the Acroban humanoid robot. The goal is to study both how properties of the body can facilitate motor control, and how to experiment and design such bodies with rapid prototyping methods.

8.1.6. *Collaboration with Labri/Univ. Bordeaux I and Institut de Neurosciences Cognitives et Integratives d'Aquitaine*

The collaboration with Olivier Ly, from Labri and Univ. Bordeaux I, as well as with Jean-René Cazalès, Christophe Halgand and Etienne Guillaud from Institut de Neurosciences Cognitives et Integratives d'Aquitaine, Bordeaux continued. The goal is to compare properties of the postural balance, and its relation to morphology and distributed control, in humans and in the humanoid Acroban (developed in collaboration with Labri), which vertebral column and postural control shares several fundamental features with the human vertebral column, and using the "Plateforme d'analyse de la motricité" available at the Institut de Neurosciences Cognitives et Integratives d'Aquitaine. This collaboration involves Matthieu Lapeyre and Pierre-Yves Oudeyer.

8.2. National Initiatives

8.2.1. ANR MACSi

An ANR Project (MACSi, ANR Blanc 0216 02), coordinated by ISIR/Univesity Paris VI (Olivier Sigaud), on developmental robotics (motor learning, visual learning, and exploration algorithms on the ICub robot) continued. The MACSi project is a developmental robotics project based on the iCub humanoid robot and the Urbi open source software platform. It is funded as an ANR Blanc project from 2010 to 2012. The project addresses four fundamental challenges, led by four partners:

- How can a robot learn efficient perceptual representations of its body and of external objects given initially only low-level perceptual capabilities? Challenge leader : Inria-ENSTA-ParisTech FLOWERS (Paris).
- How can a robot learn motor representations and use them to build basic affordant reaching and manipulation skills? Challenge leader : ISIR-UPMC-Paris 6 (Paris). ISIR hosts the iCub humanoid robot on which the achievements will be evaluated.
- What guidance heuristics should be used to explore vast sensorimotor spaces in unknown changing bodies and environments? Challenge leader : Inria-ENSTA-ParisTech FLOWERS (Bordeaux).
- How can mechanisms for building efficient representations/abstractions, mechanisms for learning manipulation skills, and guidance mechanisms be integrated in the same experimental robotic architecture and reused for different robots? Challenge leader : GOSTAI company (Paris).

Web site: <http://macsi.isir.upmc.fr/>

8.2.2. *Quasimetric approach to probabilistic optimal control (LPPA)*

- Jean-Luc Schwartz¹, Julien Diard², Pierre Bessire³, Raphael Laurent⁴, **1: GIPSA-Lab, Grenoble University, CNRS. 2: LPNC, Grenoble University, CNRS. 3: LPPA, Collège de France, CNRS. 4: GIPSA-Lab, Grenoble University.** Clément Moulin-Frier is continuing his collaborative work with people he worked with during his PhD thesis at GIPSA-Lab. See the section entitled "COSMO ("Communicating about Objects using Sensory-Motor Operations"): a Bayesian modeling framework for studying speech communication and the emergence of phonological systems" for more information.
- Jacques Droulez, Steve N'Guyen, **Laboratoire de Physiologie de Perception et de l'Action (LPPA), College de France, Paris.** Clément Moulin-Frier is continuing his collaborative work with people he worked with during his post-doc in 2011 at LPPA, College de France. See the section entitled "Probabilistic optimal control: a quasimetric approach" for more information.

8.2.3. *Collaboration and technological transfer with Laboratoire de Physiologie de la Perception et de l'Action (LPPA)*

A collaboration is in progress with Jacques Droulez and Steve Nguyen from Laboratoire de Physiologie de la Perception et de l'Action (LPPA), Paris. Poppy represents for them a humanoid platform very interesting because it is relatively flexible and versatile, with more similar proportions to that of humans, which facilitate comparison with the experimental results obtained in humans. The laboratory will evaluate this platform probabilistic methods of control of balance and locomotion.

In the short term the first experimental project with Poppy will test methods of management support, in the case of restoration of balance, in the case of walking to correct or prepare a change of direction. This project will be initiated in the framework of a long internship of master 2 that starts in January. In the future, we would also like to evaluate motor controllers compliant, and learning algorithms. This collaboration involves Matthieu Lapeyre and Pierre-Yves Oudeyer.

8.3. European Initiatives

8.3.1. FP7 Projects

8.3.1.1. EXPLORERS

Program: ERC Starting Grant

Project acronym: EXPLORERS

Project title: Exploring Epigenetic Robotics: Raising Intelligence in Machines

Duration: 12/2009-11/2014

Coordinator: Pierre-Yves Oudeyer

Abstract: In spite of considerable and impressive work in artificial intelligence, machine learning, and pattern recognition in the past 50 years, we have no machine capable of adapting to the physical and social environment with the flexibility, robustness and versatility of a 6-months old human child. Instead of trying to simulate directly the adult's intelligence, EXPLORERS proposes to focus on the developmental processes that give rise to intelligence in infants by re-implementing them in machines. Framed in the developmental/epigenetic robotics research agenda, and grounded in research in human developmental psychology, its main target is to build robotic machines capable of autonomously learning and re-using a variety of skills and know-how that were not specified at design time, and with initially limited knowledge of the body and of the environment in which it will operate. This implies several fundamental issues: How can a robot discover its body and its relationships with the physical and social environment? How can it learn new skills without the intervention of an engineer? What internal motivations shall guide its exploration of vast spaces of skills? Can it learn through natural social interactions with humans? How to represent the learnt skills and how can they be re-used? EXPLORERS attacks directly those questions by proposing a series of scientific and technological advances: 1) we will formalize and implement sophisticated systems of intrinsic motivation, responsible of organized spontaneous exploration in humans, for the regulation of the growth of complexity of learning situations; 2) intrinsic motivation systems will be used to drive the learning of forward/anticipative sensorimotor models in high-dimensional multimodal spaces, as well as the building of reusable behavioural macros; 3) intrinsically motivated exploration will be coupled with social guidance from non-engineer humans; 4) an information-theoretic framework will complement intrinsically motivated exploration to allow for the inference of body maps; 5) we will show how learnt basic sensorimotor skills can be re-used to learn the meaning of early concrete words, pushing forward human-robot mutual understanding. Furthermore, we will setup large scale experiments, in order to show how these advances can allow a high-dimensional multimodal robot to learn collections of skills continuously in a weeks-to-months time scale. This project not only addresses fundamental scientific questions, but also relates to important societal issues: personal home robots are bound to become part of everyday life in the 21st century, in particular as helpful social companions in an aging society. EXPLORERS' objectives converge to the challenges implied by this vision: robots will have to be able to adapt and learn new skills in the unknown homes of users who are not engineers. The ERC EXPLORERS is a central scientific driver of the FLOWERS team.

8.4. International Initiatives

8.4.1. Inria International Partners

- Luis Montesano, **University of Zaragoza, Spain**. Manuel Lopes collaborated with Luis Montesano on several topics. Recently on active learning approaches for grasping point learning [103] and clustering activities.
- Francisco Melo **Instituto Superior Técnico, Portugal**. Manuel Lopes collaborated with Francisco Melo on the development of active learning for inverse reinforcement learning. Recent developments consider the extension to more cues available to the learner and sampling complexity on the algorithm.
- José Santos-Victor, **Instituto Superior Técnico, Portugal**. Manuel Lopes collaborated with José Santos-Victor on the extension of affordances models to higher levels of representations, e.g. relational models.
- Maya Cakmak, Andrea Thomaz, **Georgia Tech, USA**. Manuel Lopes collaborated with Maya Cakmak on the development of optimal teaching algorithms for sequential decision problems (modeled as markov decision processes). The algorithm provides optimal demonstrations for systems that learn using inverse reinforcement learning. The joint work considers not only the algorithmic aspects but also a comparison with human behavior and the possibility of using insights from the algorithm to elicit better teaching behavior on humans [32].
- Marc Toussaint, Tobias Lang, **Free University of Berlin, Germany**. Manuel Lopes and Pierre-Yves Oudeyer are collaborating with FUB in the unification of exploration algorithms based on intrinsic motivation with methods for exploration in reinforcement learning such as R_{max} . We intend to develop a general framework for exploration in non-stationary domains [46]. Another project consider how to learn efficient representation for robotic hierarchical planning [44].
- Todd Hester and Peter Stone, **University of Texas, USA** (2012 -)
Peter Stone is a leading expert on reinforcement learning applied to real robots (he won the RobotCup competition several times) and to multi-agent problems. We started this collaboration by introducing a new method to automatically select the best exploration strategy to use in a particular problem [42]. Future directions of the collaboration will include ad-hoc teams, exploration in continuous space and human-guided machine learning.
- Jacqueline Gottlieb and Adrien Baranes, **Columbia University, New-York, US**. Pierre-Yves Oudeyer and Manuel Lopes continued a collaboration with Jacqueline Gottlieb, neuroscientist at Columbia University and specialist of visual attention and exploration in monkeys, and Adrien Baranes, postdoc in Gottlieb’s lab and previously working in Flowers team. An experimental set-up with brain imaging and behavioural observations of monkeys, and made to evaluate new families of computational models of visual attention and exploration (some of which developed in the team around the concept of intrinsic motivation) is being elaborated.
- Louis ten Bosch, **Radboud University, The Netherlands**. Pierre-Yves Oudeyer and David Filliat continued to work with Louis ten Bosch on the modelling of multimodal language acquisition using techniques based on Non-Negative Matrix Factorization. We showed that these techniques can allow a robot to discover audio-video invariants starting from a continuous unlabelled and unsegmented flow of low-level auditory and visual stimuli. A journal article is in preparation.
- Britta Wrede, Katharina Rohlfing, Jochen Steil and Sebastian Wrede, **Bielefeld University, Germany**, Jun Tani **KAIST, South Korea**. Pierre-Yves Oudeyer collaborated with Wrede, Rohlfing, Steil, Wrede and Tani on the elaboration of a novel conceptual vision of teleological language and action development in robots. This led to the publication of a joint workshop article [64].
- Michael A. Arbib, **University of Southern California (Los Angeles, USA)**. Clément Moulin-Frier is continuing his collaborative work with Michael Arbib since his 6-month visit at USC in 2009. See the section entitled “Recognizing speech in a novel accent: the Motor Theory of Speech Perception reframed” for more information.

- Paul Vogt (**Tillburg University, The Netherlands**), Linda Smith (**Indiana University, Bloomington, US**), Aslo Ozyurek (**Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands**), Tony Belpaeme (**University of Plymouth, UK**). Pierre-Yves Oudeyer began collaboration with partners of the NWO SCMSC project to set up a research network on modeling of social cognition and symbolic communication.
- Michael Gienger from **Honda Research Institute Europe**. Alexander Gepperth collaborated with Principal Scientist Dr. Michael Gienger from Honda Research Institute Europe GmbH about robotic grasping: this activity will result in a jointly supervised internship ("stage de fine d'études") and a publication.
- Ursula Korner from **Honda Research Institute Europe**. Alexander Gepperth collaborated with Dr. Ursula Körner of Honda Research Institute Europe GmbH, Offenbach (Germany), on the topic of biologically inspired learning architectures for visual categorization of behaviorally relevant entities. This work is intended to be submitted to the International Conference on Development and Learning, as well as the journal "Frontiers in Cognitive Systems".
- Michael Garcia Ortiz, **Laboratory for Cognitive Robotics (CoR-Lab) in Bielefeld, Germany**. Alexander Gepperth collaborated with Michael Garcia Ortiz, a PhD student from the Laboratory for Cognitive Robotics (CoR-Lab) in Bielefeld, Germany, on the exploitation of scene context for object detection in intelligent vehicles. This collaboration resulted in the submission of a journal publication to the journal "Neurocomputing".
- Martha White and Richard Sutton from the **University of Alberta, Canada**. Thomas Degris collaborated with Martha White and Richard Sutton on the paper "Off-Policy Actor-Critic" [38].
- Patrick Pilarski and Richard Sutton from the University of Alberta (Canada). Thomas Degris collaborated with Patrick Pilarski on the following papers: "Model-Free Reinforcement Learning with Continuous Action in Practice" [37], "Apprentissage par Renforcement sans Modèle et avec Action Continue" [65], "Dynamic Switching and Real-time Machine Learning for Improved Human Control of Assistive Biomedical Robots" [57], "Towards Prediction-Based Prosthetic Control" [58], and "Prediction and Anticipation for Adaptive Artificial Limbs" [27].
- Joseph Modayil from the **University of Alberta, Canada**. Thomas Degris collaborated with Joseph Modayil on the following paper: "Scaling-up Knowledge for a Cognizant Robot" [35].
- Ashique Rupam Mahmood from the **University of Alberta, Canada**. Thomas Degris collaborated with Ashique Rupam Mahmood on the following paper: "Tuning-Free Step-Size Adaptation" [50].

8.5. International Research Visitors

8.5.1. Visits of International Scientists

- Andrew Barto, Reinforcement learning and intrinsic motivation, University of Massachusetts Amherst, USA (oct 2012)
- Adam White, Reinforcement Learning and Artificial Intelligent group, Computing Science department of the University of Alberta, Canada (September 2012)
- Joseph Modayil, Reinforcement Learning and Artificial Intelligent group, Computing Science department of the University of Alberta, Canada (September 2012)
- Akihiko Yamaguchi, Robotics Lab of Prof. Ogasawara at NAIST in Japan (march 2012)
- Todd Hester, RL and Robotics Lab, Univ. Texas, US (may, june, july 2012)
- Louis ten Bosch, Speech processing, Univ. Radboud, The Netherlands (june 2012)
- Robert Saunders, Design Lab, Faculty of Architecture, University of Sydney, Australia (september 2012)
- Adrien Baranes, Columbia University, NY, USA (october 2012)
- Joshka Boedecker, Asada Lab, Osaka University, Japan (october 2012)

- Olivier Georgeon, Univ. Lyon, France (november 2012)

8.5.2. Internships

- Gennaro Raiola, MSc. Student from Università degli Studi di Napoli Federico II. Parameterized skills are able to map parameters of the task (for instance the 2D position of an object on a table) to the appropriate parameters of a policy for achieving this task. In this project, we use imitation learning to train a Dynamic Movement Primitive (DMP) with several observed trajectories. To achieve generalization, the basis functions in the DMP are expanded so that they span the space of the task relevant parameters. The resulting algorithm is applied to human reaching data, and to generalizing skills on the Nao robot.
- Laura Vogelaar, visiting student from GeorgiaTech and Carnegie Mellon University. Within a stochastic optimization context, we use clustering algorithms to determine features that are relevant to minimizing the cost of executing a skill. Our objective is to enable a robot to autonomously expand its libraries of skills, whilst simultaneously learning which skills can be successfully executed in which contexts.

8.5.3. Visits to International Teams

- Manuel Lopes (December 2012), Willow Garage, Palo Alto, USA: visit to Maya Cakmak to discuss tutoring systems and human-robot interaction.
- Manuel Lopes (December 2012), Bosch Research, Palo Alto, USA: visit to Dejan Pangercic to discuss active learning and human-robot interaction.
- Manuel Lopes (December 2012), Berkely University, USA: visit to Pieter Abbeel to discuss safe exploration methods and inverse reinforcement learning.
- Manuel Lopes (December 2012),
- Clément Moulin-Frier (November 2012), UC Merced, USA: visit to Anne Warlaumont's lab at UC Merced, to discuss about the role and the computational modeling of infraphonology in infant language development. The aim is to initiate a collaboration with Anne Warlaumont and D. Kimbrough Oller (University of Memphis, USA) to computationally study the possible role of intrinsic motivations in infraphonological exploration.
- Olivier Mangin (17/10/2012), Instituto Superior Técnico, Lisbon, Portugal
- Thomas Degris (June 2012), Reinforcement Learning and Artificial Intelligent group, Computing Science department of the University of Alberta, Canada (June 2012)

8.5.4. Participation to Summer/Winter School

- Jonathan Grizou participated to e'NTERFACE 2012, July, 2nd - July, 27th 2012, SUPELEC, Metz, France The 8th International Summer Workshop on Multimodal Interfaces took place on the SUPELEC campus of Metz, France. This one month summer school brought together more than 70 students and experts to work together and foster the development of tomorrow's multimodal research community. Jonathan Grizou enrolled in the Project P1 : "Speech, gaze and gesturing – multimodal conversational interaction with Nao robot", supervised by Graham Wilcock and Kristiina Jokinen (University of Helsinki). This summer school lead to a joint publication by the members of the project P1 at the CogInfoCom 2012 conference [34].
- Jonathan Grizou and Fabien Bénureau participated to the IM-CLeVeR/FIAS Winter School on "Intrinsic Motivation: From Brains to Robots", December 3-8, 2012, Frankfurt Institute for Advanced Studies, Frankfurt am Main, Germany. The school brought together 25 students in the field of intrinsic motivation as well as leaders in the field (among which, Andrew Barto, Minoru Asada, Peter Redgrave, Giorgio Metta and others). Students' time was divided between keynotes in the morning and project work in the afternoon, supervised by the speakers and the school organizers. The school was an opportunity to meet and discuss with researchers and PhD students. It also allowed us to explain and disseminate our work; Pierre-Yves Oudeyer, notably, was an invited speaker. Jonathan

Grizou took part in the project "Intrinsic Motivation in Active Perception" while Fabien Benureau participated in "Playful Acquisition of Basic Behavioral skills Machine". The results of the school are highly positive, and some scientific collaborations may directly stem from this event in the future.

IMARA Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. LINK&GO

Title: LINK&GO

Duration: 12 months

Coordinator: AKKA Group

Others partners: AKKA Technologies, Inria, ControlSys Engineering, DBT

See also: <http://automobile.yvelines.fr/fr/lappel-a-projets-2011/laureats-du-2nd-appel-a-projets/linkandgo-le-vehicule-autonome-dakka-technologies/>

Abstract: LINK&GO in a regional project financed by the CG78 (Yvelines Region). Link & Go is presented as the solution for next-generation mobility. It is the first dual-mode electric vehicle: the driver can choose between manual and automatic modes. The vehicle will move independently from the specific infrastructure such as car parks or roads. Safe and secure, Link & Go vehicle is intelligent establishing contact with the users through their personal devices and with the infrastructure via touch screen controls, voice and gestures. In addition, the system Sarveca allow the vehicle to automatically connect to the charging station can intelligently optimize the grid and facilitate the identification, payment, maintenance, etc..

8.1.2. TRANSY'VES

Title: TRANSY'VES

Duration: 12 months

Coordinator: ADM Concept

Others partners: Inria

See also: <http://automobile.yvelines.fr/fr/lappel-a-projets-2011/laureats-du-2nd-appel-a-projets/transyves-la-borne-automatique-dadm-concept/>

Abstract: The proposed project, called Transy'Ves, is based on two technological components. The first brick aims to optimize routes with electric vehicles, developing an indispensable tool for the appropriation of its use: the EVCO (Electric Vehicle Cruise Optimizer). This is a system for real-time assistance and course management for users of electric vehicles. The second brick aims to facilitate intermodal transport by developing a fully automatic guidance system in order to democratize the parking valet system in new generation parking lots.

8.2. National Initiatives

8.2.1. ANR

8.2.1.1. ABV

Title: Automatisation basse vitesse

Instrument: ANR

Duration: 2009-2012

Coordinator: IFFSTAR

Others partners: Continental, IBISC, IEF, Induct, LAMIH, Vismetris, UHA-MIPS, Veolia Environnement

See also: <http://www.projet-abv.fr/>

Abstract: This ambitious project aims at demonstrating automated driving at low speed in urban areas and on peri-urban roads. The aim is to demonstrate the technical feasibility of automating driving at low speeds, typically in situations of congestion or heavy traffic.

8.2.1.2. PUMAS

Title: Plate-forme Urbaine de Mobilité Avancée et Soutenable

Instrument: FUI

Duration: February 2010 - October 2012

Coordinator: Egis Mobilité

Others partners: Induct, Intempora, Armines, Insa-Rouen, Esigelec

See also: <http://www.projet-pumas.fr/>

Abstract: The purpose of the project PUMAS is to create a platform for travel time information for cities and towns.

8.2.1.3. SCORE@F

Title: Système COopératif Routier Expérimental Français

Instrument: FUI

Duration: 2010-2013

Coordinator: Renault-REGIENOV

Others partners: UTAC, LAB, EURECOM, IFSTTAR, Inria, Telecom Ecole de Management

See also: <http://www.scoref.fr/>

Abstract: SCORE@F (French Experimental Road Cooperative System) is a collaborative research project, experimental road cooperative systems as part of a European framework for experimentation. The SCORE@F is intended to prepare the deployment of “road cooperative systems” on motorways and other road environments through the implementation of operational tests in an open environment. Road cooperative systems are based on wireless local communication between vehicles and road infrastructure (V2I - I2V) and between vehicles (V2V). The deployment of cooperative systems will be strongly influenced by road Framework Directive of the European Commission ITS.

8.2.1.4. Travesti

Title: Traffic Volume Estimation via Space-Time Inference

Instrument: ANR SYSCOMM

Duration: January 2009 - June 2012

Coordinator: Inria (TAO)

Others partners: Armines

See also: <http://travesti.gforge.inria.fr>

Abstract: This project addresses the problem of modelling large scale complex systems to provide predictions of their macroscopic behaviour. For application purpose, we focus here on the particular problem of the real-time prediction of traffic conditions on a road network.

8.2.2. Competitivity Clusters

IMARA team is a very active partner in the competitiveness clusters, especially MOV'EO and System@tic. We are involved in several technical committees like the DAS SUR of MOV'EO for example. IMARA is also the main Inria contributor in the VeDeCoM institute (IEED). Vedecom is financing a new PhD thesis student supervised by IMARA research; his scientific research topic is on the fusion of perception and communication for pedestrian assistance, monitoring and tracking.

8.3. European Initiatives

8.3.1. FP7 Projects

8.3.1.1. DRIVE C2X

Title: DRIVE C2X – Accelerate cooperative mobility

Type: COOPERATION (ICT)

Defi: Driving implementation of car 2 x communication technology

Instrument: Integrated Project (IP)

Duration: January 2011 - December 2013

Coordinator: DAIMLER AG (Germany)

Others partners: 31 partners from automotive industry, electronic and supplier industry, software development, traffic engineering, research institutes and road operators.

See also: <http://www.drive-c2x.eu/project>

Abstract: With 31 partners, 15 support partners and 18.8 million Euro budget, DRIVE C2X will lay the foundation for rolling out cooperative systems in Europe. Hence, lead to a safer, more economical and more ecological driving.

8.3.1.2. ITSSV6

Title: IPv6 ITS Station Stack for Cooperative ITS FOTs

Type: COOPERATION (ICT)

Defi: IPV6 ITS Station Stack for Cooperative Systems FOTs

Instrument: Specific Targeted Research Project (STREP)

Duration: February 2011 - January 2014

Coordinator: Inria (France)

Others partners: Universidad de Murcia, Institut Telecom, lesswire, SZTAKI, IPTE and BlueTechnix.

See also: <http://itssv6.inria.fr/>

Abstract: ITSSv6 builds on the base of existing standards from ETSI, ISO and IETF and IPv6 software available from CVIS and GeoNet projects. Its main objectif is to deliver an optimized IPv6.

8.3.1.3. SANDRA

Title: Seamless Aeronautical Networking through integration of Data links, Radios and Antennas.

Type: COOPERATION (TRANSPORTS)

Instrument: Integrated Project (IP)

Duration: October 2009 - September 2013

Coordinator: Selex Communications (Italy)

Others partners: 30 partners.

See also: <http://www.sandra-project.eu/2012/>

Abstract: The SANDRA concept consists of the integration of complex and disparate communication media into a lean and coherent architecture for aeronautical networking.

8.3.1.4. PICA V

Title: Personal Intelligent City Accessible Vehicle System (PICA V)

Type: COOPERATION (TRANSPORTS)

Instrument: Specific Targeted Research Project (STREP)

Duration: August 2009 - July 2012

Coordinator: Univ. Gènes (Italy)

Others partners: University College London (UK), Universite di Pisa (Italy), TCB (Portugal), ZTS (Slovakia), Mazel (Spain)

See also: <http://www.dimec.unige.it/pmar/picav/>

Abstract: The proposal presents a new mobility concept for passengers ensuring accessibility for all in urban pedestrian environments. The concept addresses a new Personal Intelligent City Accessible Vehicle (PICAV) and a new transport system that integrates a fleet of PICAV units.

8.3.1.5. CATS

Title: City Alternative Transport System

Type: COOPERATION (TRANSPORTS)

Instrument: Specific Targeted Research Project (STREP)

Duration: January 2010 - December 2013

Coordinator: Lohr Industrie (France)

Others partners: CTL (I), EPFL (CH), TECHNION (IL), GEA (CH), ERT (F), and the cities of Formello (I), Strasbourg (F), Ploiesti (R)

See also: <http://www.cats-project.org>

Abstract: CATS' aim is the full development and experimentation of a new urban transport service based on a new generation of vehicle. Its major innovation is the utilisation of a single type of vehicle for two different uses: individual use or semi collective transport. This new transport service is aimed at filling the gap between public mass transport and private individual vehicles.

8.3.1.6. FURBOT

Title: Architectures of Light Duty Vehicles for urban freight transport

Type: COOPERATION (TRANSPORTS)

Instrument: Specific Targeted Research Project (STREP)

Duration: November 2011 - October 2014

Coordinator: Univ. Gènes (Italy)

Others partners: Bremach (Italy), ZTS (Slovakia), Universite di Pisa (Italy), Persico (Italy), Mazel (Spain), TCB (Portugal)

See also: <http://www.furbot.eu/>

Abstract: The project proposes novel concept architectures of light-duty, full-electrical vehicles for efficient sustainable urban freight transport and will develop FURBOT, a vehicle prototype, to factually demonstrate the performance expected.

8.3.1.7. DESERVE

Title: DEvelopment platform for Safe and Efficient dRiVE

Duration: September 2012 - August 2015

Coordinator: VTT (Finland)

Others partners: CRF (I), CONTINENTAL (F), FICOSA (I), Inria (F), TRW (GB), AVL (A), BOSCH (D), DAIMLER (D), VOLVO (S),... (26 partners)

See also: <http://www.artemis-ia.eu/project/index/view/?project=38>

Abstract: To manage the expected increase of function complexity together with the required reduction of costs (fixed and variable) DESERVE will design and build an ARTEMIS Tool Platform based on the standardization of the interfaces, software (SW) reuse, development of common non-competitive SW modules, and easy and safety-compliant integration of standardized hardware (HW) or SW from different suppliers. With innovative design space exploration (DSE) methods system design costs can be reduced by more than 15%. Hence, DESERVE will build an innovation ecosystem for European leadership in ADAS embedded systems, based on the automotive R&D actors, with possible applications in other industrial domains.

8.3.1.8. CITYMOBIL-2

Title: CityMobil-2

Duration: September 2012 - August 2016

Coordinator: University of Rome La Sapienza, CTL (Italy)

Others partners: Inria (F), DLR (D), GEA Chanard (CH), POLIS (B), ERT (B), EPFL (CH),...(45 partners!)

Abstract: The CityMobil2 goal is to address and to remove three barriers to the deployment of automated road vehicles: the implementation framework, the legal framework and the unknown wider economic effect. CityMobil2 features 12 cities which will revise their mobility plans and adopt wherever they will prove effective automated transport systems. Then CityMobil2 will select the best 5 cases (among the 12 cities) to organize demonstrators. The project will procure two sets of automated vehicles and deliver them to the five most motivated cities for a 6 to 8 months demonstration in each city. CityMobil2 will establish a workgroup that will deliver a proposal for a European Directive to set a common legal framework to certify automated transport systems.

8.4. International Initiatives

8.4.1. Inria International Partners

- NAIST (Nara Institute of Sciences and Technologies – Nara – Japan): IMARA and NAIST are extending their cooperation on research activities regarding ITS communications. In 2012, IMARA received 2 visiting researchers, 1 PhD student, and 1 internship student, deepening cooperative research activities on service discovery, geo-networking, and medium access control for vehicular communications.
- IMARA and YAMAHA Motors Company (YMC) have signed a NDA for the exchange of information in view of the participation of both parties in the New generation AGV project.
- IMARA and the South-West Research Institute (SwRI) renewed their collaboration agreement on the collaboration in the design and development of innovative Advanced Driver Assistance System.

8.4.2. Participation In International Programs

IMARA is a partner of ict-PAMM, which is an ICT-ASIA project accepted in 2011 for 2 years. It is funded by the French Ministry of Foreign Affairs and Inria. The coordinator of the project is Anne Spalanzani from UPMF University and Inria Co-coordinator is Philippe Martinet from Blaise Pascal Institute. This project aims at conducting common research activities in the areas of robotic mobile service and robotic assistance of human in different contexts of human life. From France the partners are: Inria/e-Motion, Inria/IMARA, Institut Blaise Pascal. From Asia, the partners are: ISRC-SKKU - Suwon, (Korea), ITS Lab - Kumamoto (Japan), IRA-Lab (Taiwan), Mica Institute - Hanoi (Vietnam).

<http://emotion.inrialpes.fr/people/spalanzani/HomePAMM.html>

8.5. International Research Visitors

8.5.1. Visits of International Scientists

- Professor Masatoshi Kakiuchi (Nara Institute of Sciences and Technologies) visited IMARA from November 2011 to October 2012;
- Professor Satoshi Matsuura (Nara Institute of Sciences and Technologies) visited IMARA from April 2012 to March 2013;
- Professor Plamen Petrov (Technical University of Sofia) visited IMARA from July 2012 to September 2012.

LAGADIC Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. *FUI Rev-TV project*

Participants: Céline Teulière, François Chapeau, Eric Marchand.

no. Inria Rennes 4549, duration: 36 months.

This project started in January 2010. It is composed of a consortium managed by Technicolor with Artefacto, Istia, Telecom Bretagne, Soniris, Bilboquet and Inria Lagadic and Metiss groups. The goal of this project is to provide tools to develop new TV programs allowing the final user to interact within an immersive and convivial interface. Within this project, we focused on the development of tracking algorithms (3D localization) and on visual servoing techniques for camera localization.

8.1.2. *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 is to develop an augmented reality library for smartphones.

8.1.3. *Apash project*

Participants: Rafik Sekkal, 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 6.3.6 .

8.2. National Initiatives

8.2.1. *DGA/DGCIS Rapid Canari*

Participants: Patrick Rives, Cyril Joly.

no. Inria Sophia 4979, duration : 36 months.

This project started in July 2010. It aims at developing a full autonomous indoor mobile robot dedicated to survey missions. The partners are Robopec and ECA companies. We are in charge of the development of Slam aspects. The contract supported Cyril Joly's engineer grant (see Section 6.3.3).

8.2.2. *ANR Contint Prosit*

Participants: Tao Li, Alexandre Krupa.

no. Inria Rennes 3585, duration: 46 months.

This project is led by the Prisme lab in Bourges. It started in December 2008 in collaboration with LIRMM in Montpellier, LMS in Poitiers, CHU of Tours, and the Robosoft company. Its goal is to develop an interactive master-slave robotic platform for medical diagnosis applications (tele-echography) with assistance functionalities. The work that we have realized within this project is described in Section 6.4.2 .

8.2.3. ANR Contint US-Comp

Participants: Caroline Nadeau, Alexandre Krupa.

no. Inria Rennes 3560, duration: 42 months.

This project, led by Alexandre Krupa, started in December 2008. It involves a collaboration with the Visages team in Rennes, LSIT in Strasbourg and Lirmm in Montpellier. Its goal is to provide methodological solutions for real-time compensation of soft tissues motion during ultrasound imaging. The approach consists in synchronizing the displacement of a 2D or 3D ultrasound probe to stabilize the observed image by the use of a robotic arm. The work that we have realized within this project is described in Sections 6.4.1 and 6.4.3 .

8.2.4. ANR P2N Nanorobust

Participants: Le Cui, Eric Marchand.

no. URI 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.

8.2.5. PEA Decsa

Participants: Aurélien Yol, Eric Marchand, François Chaumette.

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.

8.2.6. Equipex Robotex

Participants: Aurélien Yol, 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. This year, it allowed us to buy the Viper S650 arm and the Pioneer 3DX described in Sections 5.4 and 5.5 . In a near future, we plan to buy a humanoid robot, Romeo, by Aldebaran Robotics.

8.2.7. Inria Large Scale Initiative Action Pal

Participants: Patrick Rives, Marie Babel, François Chaumette, Luca Marchetti, Cyril Joly, Rafik Sekkal, François Pasteau.

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 6.3.6 , 6.2.4 and 6.3.5 .

8.3. European Initiatives

8.3.1. FP7 Regpot Across

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.

8.4. International Initiatives

8.4.1. Participation in International Programs

8.4.1.1. Inria/CNPq MuNave

The project MuNave (2010 - 2012) funded through the Inria/CNPq collaboration framework, succeeds to a long time collaboration between Patrick Rives and the CTI in Campinas (Brazil). This project aims at investigating new research themes in perception and control for autonomous mobile robots.

8.5. International Research Visitors

8.5.1. Visits of International Scientists

- Shogo Arai, Assistant Prof. at the University of Tohoku in Sendai, Japan, spent a two-month visit in our group in Rennes in March and April 2012 to work on visual servoing.
- Nicolas Alt, Ph.D. student at the Technische Universität München, Germany, visited our group in Sophia Antipolis from July 2 to September 26. He worked on the detection and modeling of transparent objects using a Kinect.
- Rogelio Esteller Curto, Assistant Prof. at the University of Jaume-I in Castellon, Spain, has spent a one-month visit in our group in Rennes in November 2012 to work on visual servoing.

8.5.2. Internships

Thanks to the FP7 Regpot project (see Section 8.3.1), we have got three internships from University of Zagreb from March to June 2012:

- Ante Trbojevic
- Petra Bosilj
- Petar Palasek.

Two internships from the University of Guanajuato started in December 2012:

- Raul Orlando Alvarado Lara
- Francisco Javier Rangel Butanda.

AYIN Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

- Paula Craciun and Josiane Zerubia met Antoine Mangin, Scientific Director at ACRI-ST (<http://www.acri-st.fr/English/index.html>), in Sophia Antipolis to discuss about Paula Craciun's Master research work on boats detection and counting in Mediterranean harbors using marked point processes.

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. Participation In International Programs

- In July, during the visit of Prof. Qiyin Fang from Mc Master University (<http://www.mcmaster.ca/>), Hamilton, Canada, we identified a research project of mutual interests related to new optical sensors for skin imaging and their biomedical applications. the visit of Prof. Fang was supported by the French Embassy in Canada and in November we jointly applied to the France-Canada Research Fund to be able to collaborate during the next 2 years.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

8.4.1.1. Internships

Siddharth Buddhiraju (from May 2012 until July 2012)

Subject: Satellite image classification using Bootstrap EM

Institution: IIT Bombay (India)

Paula Craciun (from March 2012 until August 2012)

Subject: Boats detection and counting in Mediterranean harbors

Institution: West University of Timisoara, Romania

8.4.1.2. Visiting professors

Qiyin Fang (One week in September 2012)

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

Institution: McMaster University (Canada)

Joseph Francos (One week in March and one week in July 2012)

Subject: Manifold embedding for geometric deformations estimation. Application to both remote sensing and skin imaging

Institution: Ben-Gurion University (Israel)

Ian Jermyn (One week in July 2012)

Subject: Object shape detection in images using prior shape information and higher order active contours

Institution: Durham University (UK)

Zoltan Kato (One week in July 2012)

Subject: Markov random fields for image segmentation

Institution: Sveded University (Hungary)

Nataliya Zagorodna (One month in July 2012)

Subject: Use of periodic or cyclic random processes for image processing, with application to both remote sensing and skin imaging

Institution: Ternopil Ivan Pul'uj Technical University (Ukraine)

8.4.2. Visits to International Teams

- Ikhlef Bechar was visiting Dr. Ian Jermyn at Durham University, UK from October 21, 2012 until November 19, 2012.
- Yannick Verdie visited National Institute of Informatics (Nii) in Tokyo, Japan from February 15, 2012 to June 15, 2012, funded by Nii internship exchange program. He worked there on the topic of exact sub graph matching by mixed-integer linear problem.

IMEDIA2 Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. *Pl@ntNet project [2009-2013]*

It is a joint project with AMAP (CIRAD, INRA, IRD, Montpellier) and Tela Botanica, an international botanical network with 8,500 members and an active collaborative web platform (10,000 visits /day). The project has its financial support from Agropolis International Foundation <http://www.agropolis.fr/> and is titled “Plant Computational Identification and Collaborative Information System”.

In addition to the results presented in [7], [13], [11], [12], [18], [20], [21], [9], [8], a demo of the Pl@ntNet platform has been done by Vera Bakic at World Wide Web conference (WWW 2012) in Lyon.

7.2. European Initiatives

7.2.1. *FP7 Projects*

7.2.1.1. *I-SEARCH*

Title: I-SEARCH (A unified framework for multimodal content SEARCH)

Type: COOPERATION (ICT)

Defi: Networked Medias & 3D Internet

Instrument: Specific Targeted Research Project (STREP)

Duration: January 2010 - December 2012

Coordinator: CENTRE FOR RESEARCH AND TECHNOLOGY HELLAS (Greece)

Others partners: CERTH (Greece), JCPC (France), ATTC (Greece), ENG (Italy), Google (Germany), UNIGE (Italy), Exalead (France), FHE (Germany), ANSC (Italy), EGR (Germany)

See also: <http://www.isearch-project.eu/isearch/>

Abstract: The I-SEARCH project aims to provide a novel unified framework for multimodal content indexing, sharing, search and retrieval. The I-SEARCH framework will be able to handle specific types of multimedia and multimodal content (text, 2D image, sketch, video, 3D objects and audio) alongside with real world information, which can be used as queries and retrieve any available relevant content of any of the aforementioned types. IMEDIA2 is workpackage leader of “RUCOD COMPLIANT Descriptor Extraction”.

7.2.1.2. *Glocal*

Title: Glocal (Event-Based Retrieval of Networked Media)

Type: COOPERATION (ICT)

Defi: Networked Medias & 3D Internet

Instrument: Integrated Project (IP)

Duration: December 2009 - November 2012

Coordinator: Univ. Degli Studi di Trento (Italy)

Others partners: UNITN (Italy), ISOCO (Spain), ALINARI (Italy), CERTH (Greece), Yahoo Iberia SL (Spain), AFP (France), DFKI (Germany), Exalead (France), LUH (Germany), BUT (Czech Republic)

See also: <http://www.glocal-project.eu/>

Abstract: The key idea underlying the project is to use events as the primary means for organizing and indexing media. Within networked communities, common (global) descriptions of the world can be built and continuously enriched by a continuous flow of individual (local) descriptions. With two leading search companies and four content providers, the consortium attempts to realize and evaluate this approach in several application domains, which will involve professional and amateur users dealing with professional and generic contents. IMEDIA2 is responsible of three research tasks related to visual-based event indexing, retrieval and mining, notably in distributed contexts.

7.2.1.3. CHORUS+

Title: CHORUS+ Network of Audio-Visual Media Search

Type: CAPACITIES (ICT)

Defi: Networked Medias & 3D Internet

Instrument: Coordination and Support Action (CSA)

Duration: January 2010 - December 2012

Coordinator: JCP-Consult (France)

Others partners: UNITN (Italy), HES-so (Switzerland), Thomson R&D (France), JCPC (France), CERTH (Greece), TU Wien (Austria), ENG (Italy), IPTS (Belgium)

See also: <http://www.ist-chorus.org/>

Abstract: CHORUS + has been funded in the continuity of the former CHORUS initiative thanks to its success. Beyond CHORUS coordination objectives, CHORUS+ includes new key issues such as extended cooperation and coordination to Asian countries and US, support to integration and implementation, support to coordinated research evaluations or support to results dissemination of EU projects. Nozha Boujemaa is part of the management board of the project.

7.3. International Research Visitors

7.3.1. Visits of International Scientists

Don Geman from John Hopkins University.

7.3.1.1. Internships

OLFA MZOUGHJI (from Jan 2012 until Jul 2012)

Subject: Analyse et description de la morphologie foliaire: Application à la classification et l'identification d'espèces de plantes

Institution: Université de Tunis El Manar - Faculté des Sciences (Tunisia)

LEAR Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. *QUAERO Project*

Participants: Mohamed Ayari, Matthijs Douze, Dan Oneata, Danila Potapov, Alessandro Prest, Jerome Revaud, Cordelia Schmid, Franck Thollard, Heng Wang.

Quaero is a French-German search engine project supported by OSEO. It runs from 2008 to 2013 and includes many academic and industrial partners, such as Inria, CNRS, the universities of Karlsruhe and Aachen as well as LTU, Exalead and INA. LEAR/Inria is involved in the tasks of automatic image annotation, image clustering as well as large-scale image and video search. See <http://www.quaero.org> for more details.

8.1.2. *ANR Project Qcompere*

Participants: Guillaume Fortier, Cordelia Schmid, Jakob Verbeek.

This three-and-a-half year project started in November 2010. It is aimed at identifying people in video using both audio (using speech and speaker recognition) and visual data in challenging footage such as news broadcasts, or movies. The partners of this project are the CNRS laboratories LIMSI and LIG, the university of Caen, Inria's LEAR team, as well as two industrial partners Yacast and Vecsys Research.

8.1.3. *ANR Project Physionomie*

Participants: Frédéric Jurie [University of Caen], Jakob Verbeek.

Face recognition is nowadays an important technology in many applications ranging from tagging people in photo albums, to surveillance, and law enforcement. In this 3-year project (2013–2016) the goal is to broaden the scope of usefulness of face recognition to situations where high quality images are available in a dataset of known individuals, which have to be identified in relatively poor quality surveillance footage. To this end we will develop methods that can compare faces despite an asymmetry in the imaging conditions, as well as methods that can help searching for people based on facial attributes (old/young, male/female, etc.). The tools will be evaluated by law-enforcement professionals. The participants of this project are: Morpho, SensorIT, Université de Caen, Université de Strasbourg, Fondation pour la Recherche Stratégique, Préfecture de Police, Service des Technologies et des Systèmes d'Information de la Sécurité Intérieure, and LEAR.

8.2. European Initiatives

8.2.1. *FP7 European Project AXES*

Participants: Ramazan Cinbis, Matthijs Douze, Zaid Harchaoui, Dan Oneata, Danila Potapov, Cordelia Schmid, Jakob Verbeek.

This 4-year project started in January 2011. Its goal is to develop and evaluate tools to analyze and navigate large video archives, eg. from broadcasting services. The partners of the project are ERCIM, Univ. of Leuven, Univ. of Oxford, LEAR, Dublin City Univ., Fraunhofer Institute, Univ. of Twente, BBC, Netherlands Institute of Sound and Vision, Deutsche Welle, Technicolor, EADS, Univ. of Rotterdam. See <http://www.axes-project.eu/> for more information.

8.2.2. *FP7 European Network of Excellence PASCAL 2*

Participants: Zeynep Akata, Adrien Gaidon, Zaid Harchaoui, Thomas Mensink, Cordelia Schmid, Jakob Verbeek.

PASCAL (Pattern Analysis, Statistical Modeling and Computational Learning) is a 7th framework EU Network of Excellence that started in March 2008 for five years. It has established a distributed institute that brings together researchers and students across Europe, and is now reaching out to countries all over the world. PASCAL is developing the expertise and scientific results that will help create new technologies such as intelligent interfaces and adaptive cognitive systems. To achieve this, it supports and encourages collaboration between experts in machine learning, statistics and optimization. It also promotes the use of machine learning in many relevant application domains such as machine vision.

8.2.3. *ERC Advanced grant Allegro*

Participant: Cordelia Schmid.

The ERC advanced grant ALLEGRO will start beginning of 2013 for a duration of five year. The aim of ALLEGRO is to automatically learn from large quantities of data with weak labels. A massive and ever growing amount of digital image and video content is available today. It often comes with additional information, such as text, audio or other meta-data, that forms a rather sparse and noisy, yet rich and diverse source of annotation, ideally suited to emerging weakly supervised and active machine learning technology. The ALLEGRO project will take visual recognition to the next level by using this largely untapped source of data to automatically learn visual models. We will develop approaches capable of autonomously exploring evolving data collections, selecting the relevant information, and determining the visual models most appropriate for different object, scene, and activity categories. An emphasis will be put on learning visual models from video, a particularly rich source of information, and on the representation of human activities, one of today's most challenging problems in computer vision.

8.3. International Initiatives

8.3.1. *Inria Associate Teams*

- **Hyperion:** Large-scale statistical learning for visual recognition, 2012–2014
Despite the ever-increasing number of large annotated image and video datasets, designing principled and scalable statistical learning approaches from such big computer vision datasets remains a major scientific challenge. In this associate team we collaborate with two teams of University of California Berkeley, headed respectively by Prof. Jitendra Malik and Prof. Nourredine El Karoui. It will allow the three teams to effectively combine their respective strengths in areas such as large-scale learning theory and algorithms, high-level feature design for computer vision, and high-dimensional statistical learning theory. It will result in significant progress in domains such as large-scale image classification, weakly-supervised learning for classification into attributes, and transfer learning.

8.3.2. *Inria International Partners*

- **Microsoft Research NY:** Zaid Harchaoui has been collaborating since the fall 2010 with Miro Dudik, formerly from Yahoo! Research (until Spring 2012), and now in the recently setup Microsoft Research New York lab, on lifted coordinate descent algorithms for large-scale learning. This collaboration lead to several published papers, including an oral presentation at CVPR 2012. Zaid Harchaoui has visited Microsoft Research NY for one week in the fall 2012. We intend to pursue this fruitful collaboration in the coming years.
- **UC Berkeley:** This collaboration between Bin Yu, Jack Gallant, Yuval Benjamini (UC Berkeley), Ben Willmore (Oxford University) and Julien Mairal (Inria LEAR) aims to discover the functionalities of areas of the visual cortex. We have introduced an image representation for area V4, adapting tools from computer vision to neuroscience data. The collaboration started when Julien Mairal was a post-doctoral researcher at UC Berkeley and is still ongoing, involving a student from UC Berkeley working on the extension of the current image model to videos.

- **UC Berkeley, Institut Curie:** In a collaboration between Jean-Philippe Vert, Elsa Bernard (Institut Curie), Laurent Jacob (UC Berkeley) and Julien Mairal (Inria LEAR) we aim to develop novel efficient optimization techniques for identification and quantification of isoforms from RNA-Seq data. Elsa Bernard was a master student between April and August 2012. She was co-advised by Jean-Philippe Vert, Laurent Jacob and Julien Mairal. Elsa Bernard has now started her PhD at Institut Curie and the collaboration is still ongoing.
- **ETH Zürich:** We collaborate with V. Ferrari, junior professor at ETH Zürich, and recently appointed as assistant professor at University of Edinburgh. V. Ferrari and C. Schmid co-supervised a PhD student (A. Prest) on the subject of automatic learning of objects in images and videos [3], [9], [20]. A. Prest was bi-localized between ETH Zürich and Inria Grenoble.

8.3.3. Participation In International Programs

- **France-Berkeley fund:** The LEAR team was awarded a grant from the France-Berkeley fund for the project with Pr. Jitendra Malik (EECS, UC Berkeley) on "Large-scale learning for image and video interpretation". The award amounts to 10,000 USD for a period of one year. The funds are meant to support scientific and scholarly exchanges and collaboration between the two teams.

MAGRIT Project-Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. ANR

- ANR ARTIS (2009-2013)
Participants: M.O. Berger, E. Kerrien, M. Loosvelt.
The main objective of this fundamental research project is to develop inversion tools and to design and implement methods that allow for the production of augmented speech from the speech sound signal alone or with video images of the speaker's face. The Magrit team is especially concerned with the development of procedures allowing for the automatic construction of a speaker's model from various imaging modalities.
- ANR Visac (2009-2012)
Participants: M.O. Berger, B. Wrobel-Dautcourt.
The ANR Visac is about acoustic-visual speech synthesis by bimodal concatenation. The major challenge of this project is to perform speech synthesis with its acoustic and visible components simultaneously. Within this project, the role of the Magrit team is to build a stereovision system able to record synchronized audio-visual sequences at a high frame rate [11].
- ANR IDeaS (2012-2016)
Participants: R. Anxionnat, M.O. Berger, E. Kerrien.
The IDeaS Young Researcher ANR grant explores the potential of Image Driven Simulation (IDS) applied to interventional neuroradiology. IDS recognizes the current, and maybe essential, incapacity of interactive simulation to exactly superimposes onto actual data. Reasons are various: physical models are often inherently approximations of reality, simplifications must be made to reach interactive rates of computation, (bio-)mechanical parameters of the organs and surgical devices cannot but be known with uncertainty, data are noisy. This project investigates filtering techniques to fuse simulated and real data. Magrit team is in particular responsible for image processing and filtering techniques development, as well as validation.

7.1.2. AEN SOFA

Participants: R. Anxionnat, M.O. Berger, E. Kerrien, A. Yureidini.

The SOFA-InterMedS large-scale Inria initiative is a research-oriented collaboration across several Inria project-teams, international research groups and clinical partners. Its main objective is to leverage specific competences available in each team to further develop the multidisciplinary field of Medical Simulation research. Our action within the initiative takes place in close collaboration with both Shacra Inria project-team in Lille and the Department of diagnostic and therapeutic interventional neuroradiology of Nancy University Hospital. We aim at providing in-vivo models of the patient's organs, and in particular a precise geometric model of the arterial wall. Such a model is used by Shacra team to simulate the coil deployment within an intracranial aneurysm. The associated medical team in Nancy, and in particular our external collaborator René Anxionnat, is in charge of validating our results.

7.1.3. Institut Pascal, Université de Clermont-Ferrand

Since June 2012, we are engaged in a collaboration with Pr. Michel Grédiac. The aim is to give a mathematical analysis and to help improving the image processing tools used in experimental mechanics at Institut Pascal.

7.2. European Initiatives

7.2.1. Collaborations with Major European Organizations

Partner 1: Imperial College, London.

Pierre-Frédéric Villard has a Honorary Research Fellow contract with Imperial College. The collaboration has involved 2 research visits in London in summer to mainly discuss about the ongoing work on parameters optimization. There was also a participation as an activity leader in two one-week summer schools on Haptic Technology (to give the basics of computer haptics, including visual and haptics rendering, force feedback, haptic interfaces, collision detection, collision response and deformation modelling).

MORPHEO Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR

8.1.1.1. ANR project *Morpho* – Analysis of Human Shapes and Motions

Morpho is aimed at designing new technologies for the measure and for the analysis of dynamic surface evolutions using visual data. Optical systems and digital cameras provide a simple and non invasive mean to observe shapes that evolve and deform and we propose to study the associated computing tools that allow for the combined analyses of shapes and motions. Typical examples include the estimation of mean shapes given a set of 3D models or the identification of abnormal deformations of a shape given its typical evolutions. Therefore this does not only include static shape models but also the way they deform with respect to typical motions. It brings a new research area on how motions relate to shapes where the relationships can be represented through various models that include traditional underlying structures, such as parametric shape models, but are not limited to them. The interest arises in several application domains where temporal surface deformations need to be captured and analyzed. It includes human body analyses but also extends to other deforming objects, sails for instance. Potential applications with human bodies are anyway numerous and important, from the identification of pathologies to the design of new prostheses. The project focus is therefore on human body shapes and their motions and on how to characterize them through new biometric models for analysis purposes. 3 academic partners will collaborate on this project: the Inria Rhône-Alpes with the Perception team and the Evasion team, the GIPSA-lab Grenoble and the Inria-Lorraine with the Alice team. Website: <http://morpho.inrialpes.fr/>.

8.1.2. Competitivity Clusters

8.1.2.1. FUI project *Creamove*

Creamove is a collaboration between the Morpheo team of the Inria Grenoble Rhône-Alpes, the 4D View Solution company specialised in multi-camera acquisition systems, the SIP company specialised in multimedia and interactive applications and a choreographer. The objective is to develop new interactive and artistic applications where humans can interact in 3D with virtual characters built from real videos. Dancer performances will be pre-recorded in 3D and used on-line to design new movement sequences based on inputs coming from human bodies captured in real time.

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. project *RE@CT*

Program: FP7 ICT STREP

Project acronym: RE@CT

Project title: IMMERSIVE PRODUCTION AND DELIVERY OF INTERACTIVE 3D CONTENT

Duration: 12/2011 - 12/2013

Coordinator: BBC (UK)

Other partners: Fraunhofer HHI (Germany), University of Surrey (UK), Artefacto (France), OMG (UK).

Abstract: RE@CT will introduce a new production methodology to create film-quality interactive characters from 3D video capture of actor performance. Recent advances in graphics hardware have produced interactive video games with photo-realistic scenes. However, interactive characters still lack the visual appeal and subtle details of real actor performance as captured on film. In addition, existing production pipelines for authoring animated characters are highly labour intensive. RE@CT aims to revolutionise the production of realistic characters and significantly reduce costs by developing an automated process to extract and represent animated characters from actor performance capture in a multiple camera studio. The key innovation is the development of methods for analysis and representation of 3D video to allow reuse for real-time interactive animation. This will enable efficient authoring of interactive characters with video quality appearance and motion. The project builds on the latest advances in 3D and free-viewpoint video from the contributing project partners. For interactive applications, the technical challenges are to achieve another step change in visual quality and to transform captured 3D video data into a representation that can be used to synthesise new actions and is compatible with current gaming technology.

8.3. International Initiatives

8.3.1. Inria Associate Teams

The Morpheo team from the Inria Grenoble Rhône-Alpes is associated with the Matsuyama lab. at the University of Kyoto. Both entities are working on the capture of evolving shapes using multiple videos and the objective of the collaboration is to make progress on the modeling of dynamic events using visual cues with a particular emphasize on human gesture modeling for analysis purposes. To this aim, the collaboration fosters exchanges between researchers in this domain, in particular young researchers, through visits between the two teams.

8.3.2. Inria International Partners

Simon Courtemanche and Lionel Reveret collaborate with Pr. Kry from University McGill (Montreal) on physical simulation of 3D character. Simon Courtemanche has spent 6 months with Pr Kry at McGill University thanks to an explora'doc regional grant. During this stay, motion capture experiments have been done on specific climbing wall equipped with force and torque sensors.

PERCEPTION Team

8. Partnerships and Cooperations

8.1. European Initiatives

8.1.1. FP7 Projects

8.1.1.1. HUMAVIPS

Title: Humanoids with audiovisual skills in populated spaces

Type: COOPERATION (ICT)

Defi: Cognitive Systems and Robotics

Instrument: Specific Targeted Research Project (STREP)

Duration: February 2010 - January 2013

Coordinator: Inria (France)

Others partners: CTU Prague (Czech Republic), University of Bielefeld (Germany), IDIAP (Switzerland), Aldebaran Robotics (France)

See also: <http://humavips.inrialpes.fr>

Abstract: Humanoids expected to collaborate with people should be able to interact with them in the most natural way. This involves significant perceptual, communication, and motor processes, operating in a coordinated fashion. Consider a social gathering scenario where a humanoid is expected to possess certain social skills. It should be able to explore a populated space, to localize people and to determine their status, to decide to join one or two persons, to synthesize appropriate behavior, and to engage in dialog with them. Humans appear to solve these tasks routinely by integrating the often complementary information provided by multi sensory data processing, from low-level 3D object positioning to high-level gesture recognition and dialog handling. Understanding the world from unrestricted s

8.2. International Research Visitors

8.2.1. Visits of International Scientists

8.2.1.1. Internships

Charlotte CLARK (from Apr 2012 until Jul 2012)

Subject: Piecewise Planar Reconstruction of a Scene from Depth Data

Institution: Massachusetts Institute of Technology (United States)

Siva KUMAR (from May 2012 until Jul 2012)

Subject: Visual Matching Using Kernel Canonical Correlation Analysis

Institution: IIT Delhi (India)

Ravi Kant MITTAL (from May 2012 until Jul 2012)

Subject: Finding Audio Visual Objects (AVO) with the Kinect

Institution: IIT Delhi (India)

Christopher STOCK (from May 2012 until Aug 2012)

Subject: Detection of keypoints on 2D manifolds

Institution: Harvard University (United States)

PRIMA Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. *EquipEx AmiQual4Home - Ambient Intelligence for Quality of Life*

Participants: Stan Borkowski, Sabine Coquillart, Joelle Coutaz, James Crowley [correspondant], Alexandre Demeure, Thierry Fraichard, Amaury Nègre, Patrick Reigner, Dominique Vaufreydaz.

Ambient Intelligence, Equipment d'Excellence, Investissement d'Avenir

The AmiQual Innovation Factory is an open research facility for innovation and experimentation with human-centered services based on the use of large-scale deployment of interconnected digital devices capable of perception, action, interaction and communication. The Innovation Factory is to be composed of a collection of workshops for rapid creation of prototypes, surrounded by a collection of living labs and supported by a industrial innovation and transfer service. Creation of the Innovation Factory has been made possible by a 2.140 Million Euro grant from French National programme "Investissement d'avenir", together with substantial contributions of resources by Grenoble INP, Univ Joseph Fourier, UPMF, CNRS, Schneider Electric and the Commune of Montbonnot. The objective is to provide the academic and industrial communities with an open platform to enable research on design, integration and evaluation of systems and services for smart habitats.

The core of the AmiQual Innovation Factory is a Creativity Lab composed of a collection of five workshops for the rapid prototyping of devices that integrate perception, action, interaction and communications into ordinary objects. The Creativity Lab is surrounded by a collection of six Living Labs for experimentation and evaluation in real world conditions. The combination of fabrication facilities and living labs will enable students, researchers, engineers, and entrepreneurs to experiment in co-creation and evaluation. The AmiQual Innovation Factory will also include an innovation and transfer service to enable students, researchers and local entrepreneurs to create and grow new commercial activities based on the confluence of digital technologies with ordinary objects. The AmiQual Innovation Factory will also provide an infrastructure for participation in education, innovation and research activities of the European Institute of Technology (EIT) KIC ICTLabs.

The AmiQual Innovation Factory is a unique combination of three different innovation instruments: (1) Workshops for rapid prototyping of devices that embed perception, action, interaction and communication in ordinary objects based on the MIT FabLab model, (2) Facilities for real-world test and evaluation of devices and services organised as open Living labs, (3) Resources for assisting students, researchers, entrepreneurs and industrial partners in creating new economic activities. The proposed research facility will enable scientific research on these problems while also enabling design and evaluation of new forms of products and services with local industry.

The AmiQual Innovation Factory will enable a unique new form of coordinated ICT-SHS research that is not currently possible in France, by bringing together expertise from ICT and SHS to better understand human and social behaviour and to develop and evaluate novel systems and services for societal challenges. The confrontation of solutions from these different disciplines in a set of application domains (energy, comfort, cost of living, mobility, well-being) is expected to lead to the emergence of a common, generic foundation for Ambient Intelligence that can then be applied to other domains and locations. The initial multidisciplinary consortium will progressively develop interdisciplinary expertise with new concepts, theories, tools and methods for Ambient Intelligence.

The potential impact of such a technology, commonly referred to as "Ambient Intelligence", has been documented by the working groups of the French Ministry of Research (MESR) [35] as well as the SNRI (Stratégie Nationale de la Recherche et de l'Innovation).

8.1.2. INRETS Intelligent Urban Spaces Platform

Participants: Claudine Combe, James Crowley [correspondant], Lukas Rummelhard.

Visual detection and tracking of pedestrians, Intelligent Urban Space

The project ANR-07-TSFA-009-01 CIPEBUS ("Carrefour Intelligent - Pôle d'Echange - Bus) has been proposed by INRETS-IFSTTAR, in collaboration with Inria, Citilog, Fareco, and the city of Versailles. The Objective of the CIPEBUS project is to develop an experimental platform for observing activity in a network of urban streets in order to experiment with techniques for optimizing circulation by context aware control of traffic lights.

Within CipeBus, Inria has developed a real time multi-camera computer vision system to detect and track people using a network of surveillance cameras. The CipeBus combines real time pedestrian detection with 2D and 3D Bayesian tracking to record the current position and trajectory of pedestrians in an urban environment under natural view conditions. The system extends the sliding window approach to use a half-octave Gaussian Pyramid to explore hypotheses of pedestrians at different positions and scales. A cascade classifier is used to determine the probability that a pedestrian can be found at a particular position and scale. Detected pedestrians are then tracked using a particle filter.

The resulting software system has been installed and tested at the INRETS CipeBus platform and is currently used for experiments in controlling the traffic lights to optimize the flow of pedestrians and public transportation while minimizing the delay imposed on private automobiles.

8.1.3. FUI 3Dlive

Participants: Frédéric Devernay, Sylvain Duchêne, Matthieu Volat.

3Dlive (<http://3dlive-project.com>) is a collaborative project, supported by French Ministry of Industry, and involving 3 industry and research clusters: Images & Reseaux (Brittany and Pays-de-la-Loire regions), Imaginove (Rhône-Alpes region), Cap Digital (Paris region). The objectives of this project are to create expertise in France for the live filming and transmission of 3D stereo contents, and to help French industry and universities to be major global 3D actors. 3Dlive won the *Loading the Future* trophy from the Images & Reseaux cluster in 2011. The consortium consists of:

R&D/industry:

Orange Labs (project leader), Technicolor (3D R&D), Thomson Video Networks (encoders) and Thales Angenieux (optics).

Small companies:

AMP (TV shooting) and Binocle (specific 3D HW & SW manufacturer).

University labs:

Inria/PRIMA and Institut Telecom.

The role of PRIMA within this project is to develop new algorithms for real-time processing of stereoscopic video streams. This includes:

stereoscopic video rectification and geometric adjustments.

view interpolation, and extraction of stereoscopic metadata for the adaptation of the stereoscopic content to the projection screen.

These algorithms rely on view- and scale- invariant feature extraction, feature matching, dense stereoscopic reconstruction, and computer graphics techniques (matting, and accelerated processing and rendering using the GPU).

8.1.4. FUI PRAMAD

Participants: Wafa Benkaouar, Claudine Combe, Dominique Vaufreydaz [correspondant].

Pramad is a collaborative project about *Plateforme Robotique d'Assistance et de Maintien à Domicile*. There are seven partners:

R&D/industry:

Orange Labs (project leader) and Covéa Tech (insurance company),

Small companies:

Wizarbox (game designer) and Robosoft (robot).

Academic labs:

Inria/PRIMA, ISIR (Paris VI) and Hôpital Broca (Paris).

The objectives of this project are to design and evaluate robot companion technologies to maintain frail people at home. Working with its partners, PRIMA research topics are:

social interaction,

robotic assistance,

serious game for frailty evaluation and cognitive stimulation.

8.1.5. Large-scale initiative action PAL

Participants: Rémi Barraquand, Thierry Fraichard, Patrick Reignier, Dominique Vaufreydaz.

The 12 Inria Project-Teams (IPT) participating in a Large-scale initiative action Personally Assisted Living (PAL <http://pal.inria.fr>) propose to work together to develop technologies and services to improve the autonomy and quality of life for elderly and fragile persons. The goal of this program is to unite these groups around an experimental infrastructure, designed to enable collaborative experimentations.

PAL is organized around 12 IPT:

Coprin, Demar, E-Motion, Flowers, Lagadic, Lagadic-Sophia, Maia, Phoenix, Prima, Pulsar, Reves and Trio.

The role of PRIMA within this project is to develop new algorithms mainly along two research axes:

assessing frailty degree of the elderly,

social interaction.

8.2. European Initiatives

8.2.1. Collaborations in European Programs

Program: CATRENE - Communication and digital lifestyle

Project acronym: AppsGate

Project title: Applications Gateway

Duration: September 2012 to March 2015

Coordinator: ST Microelectronics

Other partners: Pace, Technicolor, NXP, Myriad France SAS, 4MOD Technology, HI-IBERIA Ingeniería y Proyectos, ADD Semiconductor, Video Stream Network, SoftKinetic, Optrima, Fraunhofer, Vsonix, Evalan, University UJF/LIG, and Institut Telecom

Abstract:

AppsGate will develop an Open Platform to provide integrated home applications to the consumer mass market. The set-top box is the primary point of entry into the digital home for television services including cable TV, satellite TV, and IPTV. AppsGate will transform the set-box into a residential gateway, capable of delivering multiple services to the home, including video, voice and data. The AppsGate project is putting together chip suppliers, consumer electronics OEMs and service providers to demonstrate an advanced Set Top Box that provides a home gateway for applications in the areas of entertainment, home automation, energy management and healthcare.

This project aims at developing an Open Platform to provide integrated home applications to the consumer mass market. The set-top box is the primary point of entry into the digital home for television services including cable TV, satellite TV, and IPTV. This device has evolved beyond its historical role as a simple black box sitting on top of a large TV set into a device that supports a variety of functions, notably interactive television applications. Another interesting development is the concept of residential gateway, which is a complex device capable of delivering multiple services to the home, including video, voice and data.

Both the set-top box and the residential gateway can be combined into a unique platform to deliver the same rich experience to multiple users in different rooms. When various devices are connected to this platform and multiple applications are seamlessly integrated together, the concept of application gateway or AppsGate is born. This new platform, which offers the prospect of unprecedented business opportunities, is the focus of the project.

8.2.2. Collaborations with EIT KIC ICTlabs

ICTLabs is the KIC for ICT (<http://eit.ictlabs.eu/ict-labs/>) ICTlabs is set up as a network of 6 "co-location" centers in Helsinki, Stockholm, Berlin, Paris, Eindhoven and Trento. The Paris node is run by Inria with partners Alcatel Lucent, Orange, University Paris Sud Institut Telecom.

PRIMA actively participates in the thematic actions: Smart Spaces, Smart Energy Systems and Health and Well Being.

ICTLabs Action Line Smart Spaces (ASSP) Activity 11547 : PI3 - Pervasive Information interfaces and interaction.

With activity PI3 we have constructed and released an "Attention Recognition Module"

ICTLabs Action Line Smart Spaces (ASSP) Activity 12201 : TIK - The Interaction Toolkit

PRIMA coordinates the Activity TIK. This activity will deliver a standard library of tools for human computer interaction for smart Spaces.

ICTLabs Action Line TSES - Smart Energy Systems Activity 12201 : Activity 11831 Open SES Experience Labs

PRIMA has constructed a testbed that integrates information from multiple environmental sensor to detect and track people and recognize their activity.

ICTLabs Action Line THWB Health and Wellbeing, IActivity 12100 "Affective Computing".

PRIMA has constructed a embedded software system for mobile computing that can detect and track faces, and measure the physiological parameters of Valence, Arousal and Dominance in order to recognize and stimulate human emotion.

8.3. International Initiatives

8.3.1. Inria International Partners

Starting with the PERSPOS project (BQR Grenoble INP 2008-2009) PRIMA has a long standing collaboration the MICA center (UMI 2954 CNRS). Our current goal is to develop the concept of "large-scale" perceptive space that is an intelligent environment which will be deployed on a large surface containing several buildings (as a university campus for example). The user is assumed to wear one or many mobile intelligent wireless devices (telephone, Smartphone, PDA, notebook). Using these devices, one can use many different applications (read emails, browse the Internet, file exchange, etc.). By combining the concepts of large-scale perceptive environments and mobile computing, we can create intelligent spaces to propose services adapted to individuals and their activities. Our collaboration is focussing the user location within such a smart space.

Tracking people in smart environments remains a challenging fundamental problem. Whether it is at the scale of a campus, of a building or more simply of a room, we can dynamically combine several localization levels (and several technologies) to allow a more accurate and reliable user localization system. This collaboration was concrete with the Ph.D. thesis from Han Yue (started in November 2008). This thesis was co-supervised between Grenoble INP and Hanoi Polytechnical Institute.

8.4. International Research Visitors

8.4.1. Internships

Marco Polo Cruz Ramos (from Dec. 2011 until May 2012)

Subject: Design of Interaction Systems for Mobile Robots Collaboration.

Institution: Tecnológico de Monterrey (Mexico).

Thomas FISCHER (from Feb. 2012 until Dec 2012).

Subject: Design of a Robot Companion.

Institution: University of Buenos Aires (Argentina).

SIROCCO Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR-PERSEE

Participants: Josselin Gautier, Christine Guillemot, Laurent Guillo, Olivier Le Meur, Fabien Racapé.

- Title : Perceptual coding for 2D and 3D images.
- Research axis : § 6.2.2 , 6.1.1 .
- Partners : IRCCYN-Polytech Nantes, INSA-Rennes, Telecom Paris Tech.
- Funding : ANR.
- Period : 10/2009-08/2013

The objective of the project is to develop perceptually driven coding solutions for mono-view and multi-view video. The SIROCCO project-team contributes on different problems relevant for mono-view and multi-view video coding: visual attention modeling (see Section 6.1.1), on texture synthesis and inpainting for both 2D and 3D content. Several methods for 2D image inpainting and 2D/3D inpainting to handle disocclusions in virtual view synthesis have been developed (see Sections 6.2.2 . A computational model for 3D content has also been studied (see Section 6.1.1)

8.1.2. ANR-ARSSO

Participants: Mounira Ebdelli, Christine Guillemot, Ronan Le Boulch, Olivier Le Meur, Aline Roumy.

- Title : Adaptable, Robust, Streaming SOLUTIONS.
- Partners : Inria/Planète, TESA-ISAE, CEA-LETI/LNCA, ALCATEL LUCENT BELL LABS, THALES Communications, EUTELSAT SA.
- Funding : ANR.
- Period : 06/2010-11/2013

The ARSSO project focuses on multimedia content communication systems, characterized by more or less strict real-time communication constraints, within highly heterogeneous networks, and toward terminals potentially heterogeneous too. It follows that the transmission quality can largely differ in time and space. The solutions considered by the ARSSO project must therefore integrate robustness and dynamic adaptation mechanisms to cope with these features. The overall goal is to provide new algorithms, develop new streaming solutions and study their performances. The SIROCCO project-team contributes on the development of loss concealment methods based on video inpainting. A first approach using exemplar-based inpainting with neighbor embedding techniques has been developed. This method is currently being improved along three directions: 1/- the use of new distance metrics for finding the best matching patches; 2/- using a multi-resolution approach to both reduce the computational time and improve the robustness of the method; 3/- using mosaicking techniques for enhancing steps of stationary background and spatial inpainting. These solutions are studied in the context of a video compression and transmission chain using the emerging HEVC coding standard.

8.2. European Initiatives

8.2.1. FP7-PEOPLE-SHIVPRO

Participants: Olivier Le Meur, Zhi Liu.

- Title : Saliency-aware High-resolution Video Processing.
- Research axis : 6.1.1 .
- Partners : Visiting professor from Beijing University.
- Funding : EC-FP7 MC-IIF International Incoming Fellowships (IIF).
- Period : 08/2012-07/2014

The proposal SHIVPRO (Saliency-aware High-resolution Video Processing) submitted to the call FP7-PEOPLE-2011-IIF (funding scheme: MC-IIF International Incoming Fellowships (IIF)) has been accepted. Dr. Z. Liu, from Beijing University, has joined the team since August 2012 for two years. The objective of this project is to propose an efficient spatio-temporal saliency model to predict salient regions in High-Resolution (HR) videos, and fully exploit it to ease the design and improve the performance of HR video compression and retargeting applications. With the aim to overcome the drawbacks of existing saliency models, based on a multiscale region representation, the proposed model systematically realizes statistical model saliency measuring, intra-scale saliency modification, inter-scale saliency propagation and flexible incorporation of top-down information, to generate a novel saliency representation form with scalability, saliency tree, from which a multiscale saliency fusion scheme is used to derive high-quality saliency maps at various scales.

8.3. International Research Visitors

8.3.1. Visits of International Scientists

Mattei Mancas, researcher from the Univ. of Mons, Belgium has visited the team for two months (June-July 2012).

Dr. Zhi Liu, from Beijing University, is visiting the team since August 2012 for two years. His stay is funded by the FP7-PEOPLE-2011-IIF program. The funding scheme is the MC-IIF International Incoming Fellowships (IIF).

STARS Team

7. Partnerships and Cooperations

7.1. Regional Initiatives

7.1.1. Collaborations

- Stars has a strong collaboration with the CobTek team (CHU Nice).
- G. Charpiat works with Yuliya Tarabalka (AYIN team) and with Bjoern 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 (now LEAR team), Xavier Descombes (MORPHEME team) and Josiane Zerubia (AYIN team) on the topic of multiple object detection.

7.2. National Initiatives

7.2.1. ANR

7.2.1.1. VIDEO-ID

Program: ANR Sécurité

Project acronym: VIDEO-ID

Project title: VideoSurveillance and Biometrics

Duration: February 2008-February 2012

Coordinator: Thales Security Systems and Solutions S.A.S

Other partners: Inria; EURECOM; TELECOM and Management Sud Paris; CREDOF ; RATP

See also: <http://www-sop.inria.fr/pulsar/projects/videoid/>

Abstract: Using video surveillance, the VIDEO-ID project aims at achieving real time human activity detection including the prediction of suspect or abnormal activities. This project also aims at performing identification using face and iris recognition. Thanks to such identification, a detected person will be tracked throughout a network of distant cameras, allowing to draw a person's route and his destination. Without being systematic, a logic set of identification procedures is established: event and abnormal behaviour situation and people face recognition.

7.2.1.2. SWEET-HOME

Program: ANR Tecsan

Project acronym: SWEET-HOME

Project title: Monitoring Alzheimer Patients at Nice Hospital

Duration: November 2009-November 2012

Coordinator: CHU Nice Hospiteal (FR)

Other partners: Inria (FR); LCS (FR); CNRS unit - UMI 2954, MICA Center in Hanoi (VN); SMILE Lab , National Cheng Kung University (TW); National Cheng Kung University Hospital (TW).

Abstract: SWEET-HOME project aims at building an innovative framework for modeling activities of daily living (ADLs) at home. These activities can help assessing elderly disease (e.g. Alzheimer, depression, apathy) evolution or detecting pre-cursors such as unbalanced walking, speed, walked distance, psychomotor slowness, frequent sighing and frowning, social withdrawal with a result of increasing indoor hours.

7.2.2. FUI

7.2.2.1. QUASPER

Program: FUI

Project acronym: QUASPER

Project title: QUALification et certification des Systèmes de PERception

Duration: June 2010 - May 2012

Coordinator: THALES ThereSIS

Other partners: AFNOR; AKKA; DURAN; INRETS; Sagem Sécurité; ST Microelectronics; Thales RT; Valeo Vision SAS; CEA; CITILOG; Institut d'Optique; CIVITEC; SOPEMEA; ERTE; HGH.

See also: <http://www.systematic-paris-region.org/fr/projets/quasper-rd>

Abstract: QUASPER project gathers 3 objectives to serve companies and laboratories: (1) to encourage R&D and the design of new perception systems; (2) to develop and support the definition of European standards to evaluate the functional results of perception systems; (3) to support the qualification and certification of sensors, software and integrated perception systems. Target domains are Security, Transportation and Automotive.

7.2.3. Investment of future

7.2.3.1. 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 Genius

Other partners: IDATE, Inria(Stars), CMRR (CHU Nice) and CobTek team.

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.

7.2.4. Large Scale Inria Initiative

7.2.4.1. PAL

Program: Inria

Project acronym: PAL

Project title: Personally Assisted Living

Duration: 2010 -2014

Coordinator: COPRIN team

Other partners: AROBAS, DEMAR, E-MOTION, PULSAR, 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.

7.2.5. Collaborations

- G. Charpiat works with Gabriel Peyré, François-Xavier Vialard and Giacomo Nardi (CNRS, CEREMADE, Université Paris-Dauphine) on the topic of piecewise rigid movements.
- G. Charpiat works with Yann Ollivier (Computer Science department in Paris-Sud University (Orsay)), on the topic of image compression.

7.3. European Initiatives

7.3.1. FP7 Projects

7.3.1.1. PANORAMA

Title: PANORAMA

Duration: April 2012 - March 2015

Coordinator: Philips Healthcare (Netherlands)

Other partners :Medisys (France), Grass Valley (Netherlands), Bosch Security Systems (Netherlands), STMicroelectronics (France), Thales Angenieux (France), CapnaDST (UK), CMOSIS (Belgium), CycloMedia (Netherlands), Q-Free (Netherlands), TU Eindhoven (Netherlands) , University of Leeds (UK), University of Catania (Italy), Inria(France), ARMINES (France), IBBT (Belgium).

See also: <http://www.panorama-project.eu/>

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.

7.3.1.2. VANAHEIM

Title: Autonomous Monitoring of Underground Transportation Environment

Type: COOPERATION (ICT)

Defi: Cognitive Systems and Robotics

Instrument: Integrated Project (IP)

Duration: February 2010 - July 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).

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.

7.3.1.3. SUPPORT

Title: Security UPgrade for PORTs

Type: COOPERATION (SECURITE)

Instrument: IP

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).

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.

7.3.1.4. Dem@Care

Title: Dementia Ambient Care: Multi-Sensing Monitoring for Intelligent Remote Management and Decision Support

Type: COOPERATION (ICT)

Defi: Cognitive Systems and Robotics

Instrument: Collaborative Project (CP)

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).

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.

7.3.2. Collaborations in European Programs, except FP7

7.3.2.1. ViCoMo

Program: ITEA 2

Project acronym: ViCoMo

Project title: Visual Context Modeling

Duration: October 2009 - October 2012

Coordinator: International Consortium (Philips, Acciona, Thales, CycloMedia, VDG Security)

Other partners: TU Eindhoven; University of Catalonia; Free University of Brussels; Inria; CEA List;

Abstract: The ViCoMo project is focusing on the construction of realistic context models to improve the decision making of complex vision systems and to produce a faithful and meaningful behavior. ViCoMo goal is to find the context of events that are captured by the cameras or image sensors, and to model this context such that reliable reasoning about an event can be performed.

7.4. International Initiatives

7.4.1. Inria International Partners

7.4.1.1. 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.

7.4.1.2. Collaboration with U.S.

Stars collaborates with the University of Southern California.

7.4.1.3. Collaboration with Europe

Stars collaborates with Multitel in Belgium and the University of Kingston upon Thames UK.

7.4.2. Participation In International Programs

7.4.2.1. EIT ICT Labs

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 .

7.5. International Research Visitors

7.5.1. Visits of International Scientists

7.5.1.1. Internships

This year Stars has hosted 12 internships:

- Pierre Aittahar, Nice University.
- Guillaume Barbe, Nice University.
- Sorana Capalnean, Cluj-Napoca University.
- Cintia Corti, FCEIA Facultad de Ciencias Exactas Ingenieria y Agrimensura, National University of Rosario.
- Eben Freeman, MIT USA.
- Vaibhav Katiyar, Asian Institute of Technology Khlong Luang Pathumtani, Thailand.
- Vannara Loch, Nice University.
- Qioa Ma, Ecole centrale de Pékin, University of Beihang (China).
- Firat Ozemir, Sabancı Universitesi Orta Mahalle, University Caddesi Istanbul.
- Luis Sanchez, Buenos Aires University.
- Abhineswar Tomar , Ku Leuven University, Belgium.
- Swaminathan Sankaranarayanan, Delft University of Technology.

TEXMEX Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR Attelage de systèmes hétérogènes

Participants: Guillaume Gravier, Bogdan Ludusan.

Duration: 3 years, started in November 2009.

Partners: IRISA, LIA, LIUM

The project ASH (Automatic System Harnessing – ANR-09-BLAN-0161-03) aims at developing new collaborative paradigms for speech recognition. Many current ASR systems rely on an a posteriori combination of the output of several systems (e.g., confusion network combination). In the ASH project, we investigate new approaches in which three ASR systems work in parallel, exchanging information at every step of the recognition process rather than limiting ourselves to an a posteriori combination. What information is to be shared and how to share such information and make use of it are the key questions that the project is addressing. The collaborative paradigm is being extended to landmark-based speech recognition where detection of landmarks and speech transcription can be considered as two (or more) collaborative processes.

8.1.2. ANR FIRE-ID

Participants: Sébastien Champion, Philippe-Henri Gosselin, Patrick Gros, Hervé Jégou.

Duration: 3 years, started in May 2012.

Partner: Xerox Research Center Europe

The FIRE-ID project considers the semantic annotation of visual content, such as photos or videos shared on social networks, or images captured by video surveillance devices or scanned documents. More specifically, the project considers the fine-grained recognition problem, where the number of classes is large and where classes are visually similar, for instance animals, products, vehicles or document forms. We also assumed that the amount of annotated data available per class for the learning stage is limited.

8.1.3. ANR Secular

Participants: Laurent Amsaleg, Teddy Furon, Benjamin Mathon, Ewa Kijak.

Duration: 3 years, started in September 2012.

Partners: Morpho, Univ. Caen GREYC, Telecom ParisTech, Inria Rennes

Since their invention, content based image retrieval systems (CBRS) and biometric systems have evolved separately. This is due to the fact that they originate from different research and industrial communities. This Basic Research project, called SecuLar, groups researchers from both communities who have observed that both type of systems have indeed a lot in common in terms of goals and technological blocks. These techniques are used, however, in quite different settings possibly explaining the gap between the two. The people involved in this SecuLar project believe that what is specific to each family of approach can now benefit the other for the two following fundamental reasons.

Biometrics needs scale. The size of biometric databases quickly increases. It grows in terms of the number of records kept in the database. It also grows in terms of the size of each record as larger biometric templates maintain high quality recognition. The amount of data becomes large enough to require powerful indexing techniques. CBRS are good at this as they allow ultra fast searches of nearest neighbours in huge datasets. But porting these techniques to a biometric context is far from being easy. Biometric databases are typically protected to enforce confidentiality and privacy as security is paramount. Indexing biometric data is thus difficult because the techniques enforcing security in biometrics conflict with the technique bringing efficiency to database searches. No biometric system can today cope with both all the privacy and security constraints and the scale at which they should work in the real world for new applications.

CBRS need security and privacy. We witness a new use of CBRS these days. CBRS become the main multimedia security technology to enforce copyright laws (content monetization) or to spot illegal contents (detection of copies, paedophile images, ...) over the Internet. However, they were not designed with privacy, confidentiality and security in mind. This comes in serious conflict with their use in these new security-oriented applications. Privacy is endangered due to information leaks when correlating users, queries and the contents stored-in- the-clear in the database. It is especially the case of images containing faces which are so popular in social networks. Biometrics systems have long relied on protection techniques and anonymization processes that have never been used in the context of CBRS. Here, we plan to understand how biometrics related techniques can help increasing the security levels of CBIRS while not degrading their performance.

8.2. European Initiatives

8.2.1. *Quaero*

Participants: Laurent Amsaleg, Sébastien Campion, Vincent Claveau, Ali Reza Ebadat, Julien Fayolle, Patrick Gros, Gylfi Gudmundsson, Camille Guinaudeau, Carryn Hayward, Hervé Jégou, Ewa Kijak, Fabienne Moreau, Christian Raymond, Pascale Sébillot.

Duration: 5 years, starting in May 2008. Prime: Technicolor.

Quaero is a large research and applicative program in the field of multimedia description (ranging from text to speech and video) and search engines. It groups 5 application projects, a joint Core Technology Cluster developing and providing advanced technologies to the application projects, and a Corpus project in charge of providing the necessary data to develop and evaluate the technologies. The large scope of QUAERO's ambitious objectives allows it to take full advantage of Texmex's many areas of research, through its tasks on: Indexing Multimedia Objects, Term Acquisition and Recognition, Semantic Annotation, Video Segmentation, Multi-modal Video Structuring, Image and video fingerprinting.

In 2012, a key fact is our strong participation to Mediaeval to evaluate the technologies developed in Quaero.

8.3. International Initiatives

8.3.1. *Participation in International Programs*

Participants: Patrick Gros, Guillaume Gravier.

Duration: 2 years

Collaboration Inria-FAPEMIG with PUC Minas and UFMG – Brazil

The collaboration started this year with a visit of Patrick Gros to Belo Horizonte. The thesis of a brazilian student, Bruno Teixeira, will be co-advised, and he will spend 6 months in France next year. His work focuses on video high level description for video classification.

8.4. International Research Visitors

8.4.1. *Visits of International Scientists*

- **Visit of Fabio Guimaraes, 1 week in March 2012.** This visit was the opportunity to launch our collaboration with Brazil, which will take place in the framework of the Inria-FAPEMIG program. The main topic of the collaboration will be video multimodal description.
- **Visit of Michael Houle, National Institute of Informatics, Tokyo, Japan.** This visit was dedicated to share knowledge and initiate a collaboration for high-dimensional indexing.

8.4.2. *Internships*

- Michele Trevisiol

Dates: May 2012–July 2013 (3 months)

Subject: Geo-Tagging of Flickr videos, evaluated in the context of the Mediaeval's Placing task.

Institution: Yahoo Research & Universitat Pompeu Fabra (Barcelona)

- Giorgos Tolias

Dates: October 2012–January 2013 (5 months)

Subject: Large scale visual search

Institution: National Technical University of Athens (Greece)

WILLOW Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. Agence Nationale de la Recherche: DETECT (ENS)

Participant: Josef Sivic.

The DETECT project aims at providing new statistical approaches for detection problems in computer vision (in particular, detecting and recognizing human actions in videos) and bioinformatics (e.g., simultaneously segmenting CGH profiles). These problems are mainly of two different statistical nature: multiple change-point detection (i.e., partitioning a sequence of observations into homogeneous contiguous segments) and multiple tests (i.e., controlling a priori the number of false positives among a large number of tests run simultaneously).

This is a collaborative effort with A. Celisse (University Lille 1), T. Mary-Huard (AgroParisTech), E. Roquain and F. Villers (Univeristy Paris 6), in addition to S. Arlot and F. Bach from Inria SIERRA team and J. Sivic from Willow.

8.2. European Initiatives

8.2.1. QUAERO (Inria)

Participant: Ivan Laptev.

QUAERO (AII) is a European collaborative research and development program with the goal of developing multimedia and multi-lingual indexing and management tools for professional and public applications. Quaero consortium involves 24 academic and industrial partners led by Technicolor (previously Thomson). Willow participates in work package 9 "Video Processing" and leads work on motion recognition and event recognition tasks.

8.2.2. EIT-ICT: Cross-linking Visual Information and Internet Resources using Mobile Networks (Inria)

Participants: Ivan Laptev, Josef Sivic.

The goal of this project within the European EIT-ICT activity is to perform basic research in the area of semantic image and video understanding as well as efficient and reliable indexing into visual databases with a specific focus on indexing visual information captured by mobile users into Internet resources. The aim is demonstrate future applications and push innovation in the field of mobile visual search.

This is a collaborative effort with C. Schmid (Inria Grenoble) and S. Carlsson (KTH Stockholm).

8.2.3. European Research Council (ERC) Advanced Grant

Participants: Jean Ponce, Ivan Laptev, Josef Sivic.

WILLOW will be funded in part from 2011 to 2015 by the ERC Advanced Grant "VideoWorld" awarded to Jean Ponce by the European Research Council.

This project is concerned with the automated computer analysis of video streams: Digital video is everywhere, at home, at work, and on the Internet. Yet, effective technology for organizing, retrieving, improving, and editing its content is nowhere to be found. Models for video content, interpretation and manipulation inherited from still imagery are obsolete, and new ones must be invented. With a new convergence between computer vision, machine learning, and signal processing, the time is right for such an endeavor. Concretely, we will develop novel spatio-temporal models of video content learned from training data and capturing both the local appearance and nonrigid motion of the elements—persons and their surroundings—that make up a dynamic scene. We will also develop formal models of the video interpretation process that leave behind the architectures inherited from the world of still images to capture the complex interactions between these elements, yet can be learned effectively despite the sparse annotations typical of video understanding scenarios. Finally, we will propose a unified model for video restoration and editing that builds on recent advances in sparse coding and dictionary learning, and will allow for unprecedented control of the video stream. This project addresses fundamental research issues, but its results are expected to serve as a basis for groundbreaking technological advances for applications as varied as film post-production, video archival, and smart camera phones.

8.3. International Initiatives

8.3.1. IARPA FINDER Visual geo-localization (Inria)

Participants: Josef Sivic, Petr Gronát.

Finder is an IARPA funded project aiming to develop technology to geo-localize images and videos that do not have geolocation tag. It is common today for even consumer-grade cameras to tag the images that they capture with the location of the image on the earth's surface ("geolocation"). However, some imagery does not have a geolocation tag and it can be important to know the location of the camera, image, or objects in the scene. Finder aims to develop technology to automatically or semi-automatically geo-localize images and video that do not have the geolocation tag using reference data from many sources, including overhead and ground-based images, digital elevation data, existing well-understood image collections, surface geology, geography, and cultural information.

Partners: ObjectVideo, DigitalGlobe, CMU, Brown Univ., Cornell Univ., Univ. of Kentucky, GMU, Indiana Univ., and Washington Univ.

8.3.2. Inria Associate Team VIP

Participants: Ivan Laptev, Josef Sivic.

This project brings together three internationally recognized research groups with complementary expertise in human action recognition (Inria), qualitative and geometric scene interpretation (CMU) and large scale object recognition and human visual perception (MIT). The goal of VIP (Visual Interpretation of functional Properties) is to discover, model and learn functional properties of objects and scenes from image and video data.

Partners: Aude Oliva (MIT) and Alexei Efros (CMU). The project will be funded during 2012-2014.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

Alexei Efros (Carnegie Mellon University) and René Vidal (Johns Hopkins University) have visited Willow during summer 2012.

8.4.2. Visits to International Teams

Vincent Delaitre has visited the Robotics Institute, Carnegie Mellon University during November 2012 — January 2013, within the scope of Inria associate team VIP.

Armand Joulin has done a 3 months internship at Microsoft Research in Redmond, U.S.A.