RESEARCH CENTER

FIELD
Perception, Cognition and Interaction

Activity Report 2014

Section Contracts and Grants with Industry

Edition: 2015-03-24

DAHU Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

The CIFRE scholarship of David Montoya started in 2014, with Sinovia, Cofely Ineo (group GDF Suez). The topic is on analysis of multimodal itineraries.

DREAM Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. SoCTrace

Participants: Serge Vladimir Emteu Tchagou, Alexandre Termier.

SoCTrace is a FUI project led by STMicroelectronics, with the companies ProbaYes and Magilem, Université Joseph Fourier and Inria Rhône-Alpes. Its goal is to provide an integrated environment for storing and analyzing execution traces. In this project, we are working on data mining techniques for analyzing the traces, and on the use of ontologies to enable querying traces with a higher level of abstraction.

7.1.2. ManageYourSelf: diagnosis and monitoring of embedded platforms

Participants: Marie-Odile Cordier, Sophie Robin, Laurence Rozé.

ManageYourSelf is a project that deals with the diagnosis and monitoring of embedded platforms, in the framework of a collaboration with Telelogos, a French company expert in mobile management and data synchronization. ManageYourSelf aims to perform diagnostic and repair on a fleet of mobile smartphones and PDAs. The idea is to embed on the mobile devices a rule-based expert system and its set of politics, for example "if memory full then delete (directory)". At regular intervals the recognition is performed, using the parameters of the phones as the fact base. Of course, it is impossible to foresee all the rules in advance. Upon detection of a non anticipated problem, a report containing all the system's information prior to the problem is sent to a server. The learning step is realised using rules: crash rules are learnt, they are transformed in preventive rules by an expert and embedded on the phone.

7.1.3. Particular contract of the strategic action EDF/Inria

Participants: Thomas Guyet, René Quiniou, Véronique Masson.

At the time of digitalization of multi-channel customer relations, the analysis of customer pathways has become a strategic issue for any business unit. The interaction traces left by clients when connecting to the customer services can be combined with data from other communication channels (phone, web form, e-mail, mail, fax, SMS, shop, etc.) and allow to analyse the customer pathways in details.

Pattern mining tools are able to extract the frequent customer behaviors in very large database of client pathways, but taking into account the duration and the delay between the customer actions remains a challenging issue for pattern mining. The objective of this one year particular contract was to design and to develop a frequent mining tool taking into account the time dimension for analysis of multichannel customer pathways.

EXMO Project-Team (section vide)

GRAPHIK Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. CTFC

Participants: Patrice Buche, Jérôme Fortin.

We collaborate since 2012 with the technical center of Comptois' cheese (CTFC : Centre Technique des Fromages Comtois). The objective of this collaboration is to design and test a platform for expert knowledge management. This allows us to validate the integration of our theoretical tools into a real-world application and strengthen GraphIK's involvement in agronomy applications. A master degree internship in collaboration with CTFC was done by Awa Diattara (University Gaston Berger of Saint-Louis, Sénégal) in 2012. Awa Diattara came back as engineer to complete her work for a six month period in 2013. In order to evaluate our approach on different agri-food chains, we have initiated a work with Panzani (6 months internship of Laureline Estival 2013-2014) and established fruitful contacts with other partners.

This collaboration will be strengthened in 2015 in a enlarged project involving different traditional food chains (CNAOL, Conseil National des Appelations d'Origine Laitière). The new project called « OcamEx : Outil de capitalisation et de mobilisation du savoir-faire et de l'expérience fromagers en filière valorisant leur terroir. » is presented as a collaboration with technical partners (Ceraq, CTFC (Centre Technique des Fromages Comtois), Pôle fromager AOP Massif Central, Institut de l'Elevage, Actalia, Typ-Tech), CNAOL (Conseil national des appellations d'origines laitières) scientific partners (INRA Aurillac, INRA URTAL Poligny, UMR IATE (équipe Ingénierie des connaissances), UMR LIRMM/Inria (équipe GraphiK), UMR HEUDIASYC (équipe Décision), Agrosup Dijon UR DPF, INRA UMR I2M Bordeaux, ENSC Bordeaux training partners : Enils from Aurillac, Mamirolle-Poligny and la Roche sur Foron Cheese partners : Comté (CIGC), Reblochon (SIR), Emmental (Savoicime), Cantal et Salers (CIF)

The aim of this collaboration is to develop a platform that will be used in traditional cheese processing for expert knowledge management.

7.1.2. ABES

Participants: Michel Leclère, Michel Chein, Madalina Croitoru, Léa Guizol.

Collaboration with ABES. Funding of half a PhD grant (Léa Guizol, 2011-2014). See Section 6.4 .

7.1.3. Panzani

Participants: Patrice Buche, Jérôme Fortin, Laureline Estival, Bernard Cuq.

We have initiated a national collaboration with Panzani. The objective of this collaboration is to test and get new feedbacks about the platform for expert knowledge management. A master degree internship in collaboration with Panzani was done by an agronomy student, Laureline Estival (Agrosup Dijon), in 2013. This internship enabled us to validate the interest of our tool for Panzani by showing that our techniques could deal with several types of applications while being usable by non computer sciences experts.

Laureline Estival has continued her work, financed by Panzani, as an engineer to complete the knowledge base for a six month period in 2013-14.

LINKS Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

Innovimax, Cifre and Engineer (2010-2014) The PhD thesis of Tom SEBASTIAN within the QUIXPROC project is supervised byJ.NIEHREN in cooperation with M.ZERGAOUI the head of the INNOVIMAX company. The software development in this context is supported by D. DEBARBIEUX, a senior engineer co-funded by INNOVIMAX and Inria.

MAGNET Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. Cifre SAP (2011-2014)

Participants: Thomas Ricatte, Marc Tommasi, Rémi Gilleron [correspondent].

In business intelligence information systems, one of the first tasks is to acquire and clean internal data and then enrich them with additional sources of informations. This preprocessing step is well planned and specialized for fixed analysis and fixed dashboards. The subject of our collaboration with SAP was included in general objective that (i) specializes this preprocessing task in order to deal with external data coming from networked data like social networks and open relational data, and (ii) simplifies the adaptation of the processing step evolving data analysis tasks. We have focused on the task of merging information acquired from many input data sources represented as graphs, with the final objective of providing a unique graph representation of all data or data models. This research has lead to new graph combination algorithms, but has also raised the need for representing and managing high order relations using graph-like techniques.

RÉMI GILLERON supervises the PhD thesis (Cifre) of Thomas Ricatte together with Yannick Cras from SAP.

7.1.2. Cifre Clic and Walk (2013-2016)

Participants: Pauline Wauquier, Marc Tommasi, Mikaela Keller [correspondent].

We start a one to one cooperation with the CLIC AND WALK company that makes marketing surveys by consumers (called clicwalkers). The goal of the company is to understand the community of clicwalkers (40 thousands in one year) and its evolution with two objectives: the first one is to optimize the attribution of surveys to clicwalkers, and the second is to expand company's market to foreign countries. Social data can be obtained from social networks (G+, Facebook, ...) but there is no explicit network to describe the clicwalkers community. But users activity in answering surveys as well as server logs can provide traces of information diffusion, geolocalisation data, temporal data, sponsorship, ...We will study the problem of adaptive graph construction from the clicwalkers network. Node (users) classification and clustering algorithms will be applied. For the problem of survey recommendations, the problem of teams constitution in a bipartite graphs of users and surveys will be studied. Random graph modeling and generative models of random graphs will be one step towards the prediction of the evolution of clicwalkers community.

MIKAELA KELLER and MARC TOMMASI supervise the PhD thesis (Cifre) of PAULINE WAUQUIER on graph-based recommendation together with Guillaume André from CLIC AND WALK.

MAIA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Inria-EDF Strategic action MS4SG

Participants: Vincent Chevrier, Julien Vaubourg, Victorien Elvinger.

Laurent Ciarletta, Yannick Presse and Benjamin Segault (Madynes team, LORIA) are external collaborators.

The MS4SG (multi-simulation for smart grids) project is granted as a strategic action between Inria and EDF. This project is joint between Madynes and MAIA team from Inria-NGE and EDF R&D.

Smart-grids are electric supply grids endowed with smart capabilities because of the use of information and communication technologies. This perspective of smart grids corresponds to new challenges and it is needed to re-think the way electricity is supplied to customers and the power supply network regulated.

The simulation approach can be taken to envisage the supervision and regulation of these systems. Such an approach implies to integrate simulators coming from different domains: electrical networks, communication networks and information systems. As these domains can influence each other, smart-grids can be considered as a kind of complex system and we are faced with multi-modeling and multi-simulation issues: models in these simulators (and therefore simulators softwares) are heterogeneous (at least equation based and event based models), the softwares used are existing ones, etc.

The aim of the project is to provide primitives based on AA4MM in order to enable the multi-modeling and the multi-simulation of smart-grids.

OAK Project-Team (section vide)

ORPAILLEUR Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. The BioIntelligence Project

Participants: Mehwish Alam, Aleksey Buzmakov, Melisachew Chekol, Adrien Coulet, Marie-Dominique Devignes, Amedeo Napoli [contact person], Nicolas Pépin-Hermann, Malika Smaïl-Tabbone.

The objective of the "BioIntelligence" project is to design an integrated framework for the discovery and the development of new biological products. This framework takes into account all phases of the development of a product, from molecular to industrial aspects, and is intended to be used in life science industry (pharmacy, medicine, cosmetics, etc.). The framework has to propose various tools and activities such as: (1) a platform for searching and analyzing biological information (heterogeneous data, documents, knowledge sources, etc.), (2) knowledge-based models and process for simulation and biology in silico, (3) the management of all activities related to the discovery of new products in collaboration with the industrial laboratories (collaborative work, industrial process management, quality, certification). The "BioIntelligence" project is led by "Dassault Systèmes" and involves industrial partners such as Sanofi Aventis, Laboratoires Pierre Fabre, Ipsen, Servier, Bayer Crops, and two academics, Inserm and Inria. An annual meeting of the project usually takes place in Sophia-Antipolis at the beginning of July.

Two theses related to "BioIntelligence" are currently in preparation within the Orpailleur team. A first thesis is related to the mining of complex biological data using FCA and RCA techniques [47], [48], [49]. The objective is to take advantage of Linked Open Data in biology for helping the biologist for querying and navigating complex data. There are needs to integrate data and knowledge from several web biological resources. At present, some experiments are conducted on designing practical interfaces based on sophisticated visualization tools for allowing human agents to have an easy and quick access to interesting patterns .

A second thesis is based on an extension of FCA involving Pattern Structures on complex data such as sequences and graphs [107]. The idea is to extend the formalism of pattern structures to these complex data for being able to classify complex structures such as patient trajectories or molecular structures. The classification results (e.g. concept lattices) are expected to help practitioners in information retrieval tasks and specific problem solving. In addition, a theoretical and practical work was conducted on the evaluation of interest measures for selecting the best concepts to be analyzed by a human agent in a concept lattice, and especially the stability measure in FCA. This led to a series of original and pioneering experiments on this probably underestimated research subject [20], [54], [53].

7.2. The Quaero Project

Participants: Victor Codocedo [contact person], Ioanna Lykourentzou, Amedeo Napoli.

The Quaero project (http://www.quaero.org) is a program aimed at promoting research and industrial innovation on technologies for automatic analysis and classification of multimedia and multilingual documents (the project ended at the beginning of 2014). The partners collaborate on research and the realization of advanced demonstrators and prototypes of innovating applications and services for access and usage of multimedia information, such as spoken language, images, video and music.

In this framework, the Orpailleur team worked on information retrieval, document annotation and recommendation. The objective was to define methods and algorithms for achieving these complex tasks, based on KDDK techniques and especially the FCA technology.

Part of the thesis of Victor Codocedo was prepared in this context, focusing on information retrieval guided by domain knowledge, recommendation and classification of documents w.r.t. sets of annotations using FCA and pattern structures [2] [58], [22].

SMIS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

The SMIS project has a long lasting cooperation with Gemalto, the world's leading providers of microprocessor cards. Gemalto provides SMIS with advanced hardware and software smart card platforms which are used to validate numbers of our research results. In return, SMIS provides Gemalto with requirements and technical feedbacks that help them adapting their future platforms towards data intensive applications. While no bilateral contract exists between Gemalto and SMIS, we are partners in several projects. Meanwhile, we are developing partnerships with SMEs capable of building ad-hoc hardware prototypes conforming to our own design.

7.2. DMSP3 Yvelines District Grant (Nov 2013 - Nov. 2014)

Partners: Inria-SMIS (coordinator), Gemalto, UVSQ, Santeos.
SMIS funding: 75k€.
Electronic Health Record (EHR) projects have been launched in most developed countries to increase the quality of care while decreasing its cost. Despite their unquestionable benefits, patients are reluctant to abandon their control of highly sensitive data to a distant server. The objective of the DMSP project is to complement a traditional EHR server with a secure and mobile personal medical folder (1) to protect and share highly sensitive data among trusted parties and (2) to provide a seamless access to the data even in disconnected mode. The DMSP architecture builds upon the technology designed in the PlugDB project. This architecture has been designed and developed under grant DMSP1 ended in 2010. It has been experimented in the context of a medical-social network providing care and services at home for elderly people. The experiment in the field, founded by grant DMSP2, lasted from September 2011 to December 2012 with volunteer patients and practitioners in the Yvelines district. The goal of grant DMSP3 (Nov 2013 - Nov 2014) is to correct the imperfections observed during DMSP2 and port our prototype in an open hardware platform with the final objective to set up a technology transfer. This project is being audited by ARS-Ile de France (the Regional Healthcare Agency) and CG78 (General Council of Yvelines District), in order to envision the opportunity of a larger deployment.

7.3. Cozy Cloud bilateral contract (Dec 2014 - Nov. 2015)

Partners: Cozy Cloud, Inria-SMIS
SMIS funding: 50k€.
Many personal data end up today on servers where they can be scrutinized by companies and governmental agencies. To face this situation, the most emblematic initiative is the Personal Cloud paradigm. Roughly speaking, the Personal Cloud is an architecture which gives users the ability to store their complete digital environment, synchronize it among various devices and share it with other users and applications under their control. It reflects the expectation of the individuals for the emergence of privacy-by-design next-generation storage and computing services. Cozy Cloud is a French startup providing such a personal Cloud platform. The Cozy product is a software stack that anyone can deploy to run his personal server in order to host his personal data and web services. Cozy defines itself as the "Android of personal servers". While centralizing all personal data in the holder's hand is a natural way to reestablish his control on his privacy, this represents an unprecedented threat in case of attacks by an intruder, especially for individuals who are not security experts. The objective of this bilateral contract is typically to address this issue by integrating the PlugDB solution into the Cozy stack. Roughly speaking, the Cozy data system will be modified in such a way to store only encrypted files and each file access will be intercepted and routed to PlugDB. PlugDB will act as a doorkeeper for the whole individual dataspace by managing the files' metadata, the access control rules defined on these metadata, the decryption keys and the user/application authentication.

7.4. Cozy Cloud CIFRE contract (Oct 2014 - Sept 2017)

Partners: Cozy Cloud, Inria-SMIS
SMIS funding: 30k€.
In relation with the bilateral contract mentioned above, a CIFRE PhD thesis has been started by Paul Tran Van. The objective is to capitalize on the Cozy-PlugDB platform to devise new access and usage control models to exchange data among devices of the same user (devices may have different levels of trustworthiness) and among different users. A particular focus will be put on the enforcement of the access and usage control rules in this thesis.

WIMMICS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

We have a PhD Thesis grant with Alcatel Lucent Bell Labs on *Linked Data Based Exploratory Search*.

We also have a PhD Thesis grant with Synchronext on *Assistant Conversational Agents with Natural Language and Intuition*.

ZENITH Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Microsoft (2013-2017)

Participants: Ji Liu, Esther Pacitti, Patrick Valduriez.

This joint project is on advanced data storage and processing for cloud workflows with the Kerdata team in the context of the Joint Inria – Microsoft Research Centre. The project addresses the problem of advanced data storage and processing for supporting scientific workflows in the cloud. The goal is to design and implement a framework for the efficient processing of scientific workflows in clouds. The validation h will be performed using synthetic benchmarks and real-life applications from bioinformatics: first on the Grid5000 platform in a preliminary phase, then on the Microsoft Azure cloud environment.

7.2. EDF R&D (2013-2014)

Participants: Tristand Allard, Florent Masseglia, Esther Pacitti.

This project aims at developping new data mining techniques for P2P networks. The main goal is to preserve data privacy, while achieving good performance of analysis processes on the tackled data. More precisely, each participant in the P2P network has its own individual data (e.g. results of experiments for a scientific partner) and all the participants would like to acquire knowledge computed on the whole dataset (i.e., the union of all the individual data on the peers). Meanwhile, participants want a guarantee that no other participant will be able to see their data. The P2P protocol we have developped is now able to extract knowledge from the whole set of distributed data, while avoiding centralization, and guaranteeing data privacy for all peers. The work is currently the subject of a patent between EDF and Inria (patent number in progress).

7.3. Triton I-lab (2014-2016)

Participants: David Fernandez, Houssem-Eddine Chihoud, Didier Parigot.

Triton is a new common lab. (i-lab) created between Zenith and Beepeers (beepeers.com) to work on a platform for developing social networks in mobile/Web environments. The main objective of this project is to design and implement a new architecture for beepeers applications to move to the scale. This new architecture will build on our SON middleware and new NoSQL database technologies, especially graph databases.

ALICE Project-Team (section vide)

AVIZ Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Google Research Award

Participants: Jean-Daniel Fekete [correspondant], Petra Isenberg, Jeremy Boy, Heidi Lam.

Offering data access to the public is a strong trend of the recent years. Several free data providers or repositories are now online (e.g. http://data.gov.uk, http://stats.oecd.org, http://publicdata.eu, http://opendata.paris.fr, http://www.google.com/publicdata, http://www.data-publica.com), offering a rich set of data to allow citizens to build their own understanding of complex political and economic information by exploring information in its original form. However, these initiatives have had little impact directly on the public since working with this open data is often cumbersome, requires additional data wrangling, and the spreadsheets themselves take a long time to understand before useful further work can be done with them. This proposal focuses on public data visualization to offer more engaging environments for exploration of public data and to enable stronger democratic discourse about the data contents.

The goal of this proposed research project is to bridge the gap between generic visualization sites for public data and engaging content-specific visualization of this data which can be used and individually adapted to tell a story about public data. Through the design and deployment of rich and engaging interactive visualizations from public data sources we want to truly reach the goal of the public data movement: empowering the citizens and social actors by allowing them to better understand the world they are living in, to make informed decisions on complex issues such as the impact of a medical treatment on a dangerous illness or the tradeoffs offered of power plant technologies based on facts instead of assumptions.

For more information, see http://peopleviz.gforge.inria.fr/www.

HYBRID Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Mensia Technologies

Participants: Jozef Legény, Jussi Lindgren, Anatole Lécuyer.

Mensia Technologies is an Inria start-up company created in November 2012 as a spin-off of Hybrid team. Mensia is focused on wellness and healthcare applications emerging from the BCI and Neurofeedback technologies. The Mensia startup should benefit from the team's expertise and of valuable and proprietary BCI research results. Mensia is based in Rennes and Paris. Anatole Lécuyer and Yann Renard (former Inria expert engineer who designed the OpenViBE software architecture and was involved in team projects for 5 years) are co-founders of Mensia Technologies together with CEO Jean-Yves Quentel.

The on-going contract between Hybrid and Mensia started in November 2013 and supported the transfer of several softwares designed by Hybrid team ("OpenViBE", "StateFinder") related to our BCI activity and our OpenViBE software (section 5.1) to Mensia Technologies for 5 years, for future multimedia or medical applications of Mensia.

7.1.2. MBA Multimedia

Participants: Ferran Argelaguet Sanz, Maud Marchal, Anatole Lécuyer.

This on-going contract started in June 2013 and supported the transfer of several softwares designed by Hybrid team ("3D Cursors", "Elastic Images") in the frame of the W3D project to MBA Multimédia company for future applications in the field of multimedia and web design based mainly on HTML5 and Word Press software.

7.1.3. Polymorph Studio

Participants: Ferran Argelaguet Sanz, Maud Marchal, Anatole Lécuyer.

This on-going contract started in June 2013 and supported the transfer of several softwares designed by Hybrid team ("3D Cursors", "Pseudo-haptik", "Elastic Images") in the frame of the W3D project to Polymorph Studio company for future applications in the field of multimedia and web design based mainly on Unity3D software.

7.2. Bilateral Grants with Industry

7.2.1. Orange Labs

Participant: Anatole Lécuyer.

This grant started in October 2012 and ended in 2014. It has supported Pierre Gaucher's CIFRE PhD program on "Novel 3D interaction techniques based on pseudo-haptic feedback".

7.2.2. Technicolor

Participants: Fabien Danieau, Anatole Lécuyer.

This grant started in January 2011 and ended in 2014. It has supported Fabien Danieau's CIFRE PhD program on "Improving audiovisual experience with haptic feedback".

IMAGINE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts and Grants with Industry

7.1.1. Airbus - Idealization of components for structural mechanics (06/2011 - 06/2014)

Participants: Stefanie Hahmann, Jean-Claude Léon.

Cifre PhD in partnership with Airbus group to generate the shape of mechanical components through dimensional reduction operations as needed for mechanical simulations, e.g. transformations from volume bodies to shells or plates forming surface models, usually non-manifold ones. The topic addressed covers also the shape detail removal process that takes place during the successive phases where subsets of the initial shape are idealized. Mechanical criteria are taken into account that interact with the dimensional reductions and the detail removal processes. The goal is to define the transformation operators such that a large range of mechanical components can be processed as automatically and robustly as possible. Two major results have been obtained to generate construction graphs from CAD models and use a construction graph to generate a dimensionnally reduced model suited for Finite Element Analyses.

7.1.2. HAPTIHAND technology transfer project (Inria-HAPTION-Arts et Métiers ParisTech) (10/2012-08/2014)

Participant: Jean-Claude Léon.

The objective is to transfer a device, named HandNavigator, that has been developed in collaboration with Arts et Métiers ParisTech/Institut Image, as add on to the 6D Virtuose haptic device developed by HAPTION. The purpose of the HandNavigator is to monitor the movement of a virtual hand at a relatively detailed scale (movements of fingers and phalanxes), in order to create precise interactions with virtual objects like object grasping. This includes monitoring the whole Virtuose 6D arm and the HandNavigator in a virtual environment, for typical applications of maintenance simulation and virtual assembly in industry. The project covers the creation of an API coupled to physical engine to generate and monitor a realistic and intuitive use of the entire device, the creation of physical prototypes incorporating multiple sensors for each user's finger. The physical prototypes have been developed using rapid prototyping technologies like the 3D printing device available from the Amiqual4Home project (ANR-11-EQPX-0002).

IN-SITU Project-Team (section vide)

MANAO Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

- CIFRE PhD contract with Technicolor 2 (2014-2018)
  Participants: A. Dufay, X. Granier, and R. Pacanowski
  For this project, we aim at providing interactive previsualization of complex lighting with a smooth transition to the final solution.

MAVERICK Project-Team (section vide)

MIMETIC Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Faurecia

Participants: Franck Multon [contact], Pierre Plantard.

This contract aims at developing new ergonomics assessments based on inaccurate Kinect measurements in manufactures on real workers. The main challenges are:

- being able to improve the Microsoft Kinect measurement in order to extract accurate poses from depth images while occlusions may occur,
- developing new inverse dynamics methods based on such inaccurate kinematic data in order to estimate the joint torques required to perform the observed task,
- and proposing a new assessment tool to translate joint torques and poses into potential musculoskeletal disorders risks.

Faurecia has developed its own assessment tool but it requires tedious and subjective tasks for the user, at specific times in the work cycle. By using Kinect information we aim at providing more objective data over the whole cycle not only for specific times. We also wish to make the user focus on the interpretation and understanding of the operator's tasks instead of taking time estimating joint angles in images.

This work is performed in close collaboration with an ergonomist in Faurecia together with the software development service of the company to design the new version of their assessment tool. This tool will be first evaluated on a selection of manufacture sites and will then be spread worldwide among the 270 Faurecia sites in 33 countries.

This contract enabled us to hire Pierre Plantard as a PhD student to carry-out this work in MimeTIC and M2S Lab. He started in January 2013 and will finish in December 2015.

In 2014, we have developed a testbench based on virtual humans in order to evaluate the expected accuracy of a Kinect sensor in work conditions: the Kinect cannot be placed at a location compatible with the provider's recommendation. This testbench enabled us to evaluate more than 500000 configurations (Kinect location and upper-limb poses) with a virtual mannequin and a simulated Kinect. It will help to design the most appropriate protocol according to the work condition and the poses used by the operators at workstation.

MINT Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Autodesk Research (Feb. 2014-Apr. 2014)

Participant: Fanny Chevalier [correspondant].

The correspondant worked with Autodesk Research as a consultant for the Kitty project. The Inria correspondant, Fanny Chevalier, providied scientific advices on the design and evaluation of the prototype of Kitty [23], a sketch-based tool for authoring dynamic and interactive illustrations.

POTIOC Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Interactive Collaboration in Virtual Reality for Aerospace Scenarii:

- duration: 2014-2017
- PhD Thesis of Damien Clergeaud
- partners: Airbus Group Innovations, Airbus Defence & Space
- The objective of this work is to explore the problems of remote collaboration in the context of virtual reality for aerospace applications. It relates to an interaction between an immersed user and remote operators equipped with various communication tools (desktop computers, tablets, touch tables...) or an interaction between a user and a remotely operated robot.

REVES Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Autodesk

Participants: Adrien Bousseau, George Drettakis, Clement Riant, Sylvain Duchene.

We continued our technology transfer agreement with Autodesk concerning the RID technology on single-lighting condition intrinsic images. We transferred a version of the software on Autodesk servers.

7.2. Bilateral Grants with Industry

7.2.1. Adobe

Participants: George Drettakis, Gaurav Chaurasia.

Adobe has offered a small donation in the context of our collaboration on compilers for image processing (Sec. 6.2.2).

TITANE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Astrium

Participants: Sven Oesau, Florent Lafarge, Pierre Alliez.

The main goal of this collaboration is to devise new algorithms for reconstructing 3D indoor models that are more accurate, meaningful and complete than existing methods. The conventional way for modeling indoor scenes is based on plane arrangements. This type of representation is particularly limited and must be improved by devising more complex geometric entities adapted to a detailed and semantized description of scenes.

- Starting date: April 2012

- Duration: 3 years

7.1.2. Geoimage

Participants: Liuyun Duan, Florent Lafarge.

The aim of this collaboration is to devise a new type of 2.5D representation from satellite multi-view stereo images which is more accurate, compact and meaningful than the conventional DEMs. A key direction consists in incorporating semantic information directly during the image matching process. This semantic is related to the type of components of the scene, such as vegetation, roofs, building edges, roads and land.

- Starting date: November 2013

- Duration: 3 years

7.1.3. Technicolor

Participants: Xavier Rolland-Neviere, Pierre Alliez.

The goal of this collaboration was to devise a method for watermarking 3D models, with resilience to a wide range of attacks and poses.

- Starting date: October 2012

- Duration: 3 years

ALPAGE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts with Industry

Alpage has developed several collaborations with industrial partners. Apart from grants described in the next section, specific collaboration agreements have been set up with the following companies:

- Verbatim Analysis (license agreement, transfer agreement, "CIFRE" PhD, see section 4.3),
- Lingua et Machina (DTI-funded engineer, see section 4.4),
- viavoo (PhD of Marion Baranes, employed at viavoo, which started in 2012 on automatic normalisation of noisy texts),
- Yseop ("CIFRE" PhD of Raphael Salmon which started in 2012 on automatic text generation)
- CEA-List (PhD of Quentin Pradet on the annotation of semantic roles in specific domains. The thesis has finished on the 12/31/2015 (defense on the 02/06/2015).
- Proxem (consulting)

MULTISPEECH Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Besides the contracts listed below, for which MULTISPEECH is officially part of, E. Vincent was involved through his former team (PANAMA) in another 30-month bilateral research contract with Studio MAIA.

7.1.1. MAIA

Company: Studio MAIA

Duration: September 2014 - August 2015

Supported by: Bpifrance

Abstract: A pre-study contract was signed to investigate speech processing tools that could eventually be transferred as plugins for audio mixing software. Prosody modification, noise reduction, and voice conversion are of special interest.

7.1.2. Venatech

Company: Venathec SAS

Other partners: ACOEM Group, GE Intelligent Platforms (contracted directly with Venathec)

Duration: June 2014 - August 2017

Supported by: Bpifrance

Abstract: The project aims to design a real-time control system for wind farms that will maximize energy production while limiting sound nuisance. This will leverage our know-how on audio source separation and uncertainty modeling and propagation.

PANAMA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Contract with Studio MAIA

Participants: Nancy Bertin, Frédéric Bimbot, Jules Espiau de Lamaestre, Jérémy Paret, Nathan Souviraà -Labastie.

Duration: 3 years (2012–2014).

Research axis: 3.2.2

Partners: Studio MAIA (Musiciens Artistes Interprètes Associés), Imaging Factory

This contract aims at transfering some of the research done within PANAMA towards new services provided by MAIA Studio.

More specifically, the main objective is to adapt source separations algorithms and some other advanced signal processing techniques elaborated by PANAMA in a user-informed context.

The objective is twofold:

- partial automation of some tasks which the user previously had to accomplish manually
- improved quality of separation and processing by exploiting user inputs and controls

The resulting semi-automated separation and processing will feed an integrated software used for the professional remastering of audiovisual pieces. New PANAMA tools were integrated in the software developed by Imaging Factory and delivered to MAIA in May 2014, and the final release will be delivered in December 2014.

7.2. Bilateral Grants with Industry

7.2.1. CIFRE contract with Technicolor R&I France on Compressive Sensing for the manipulation of large multimedia databases

Participants: Rémi Gribonval, Anthony Bourrier.

Duration: 3 years (2011-2014)

Research axis: 3.1.2

Partners: Technicolor R&I France, Inria-Rennes

Funding: Technicolor R&I France, ANRT

The objective of this thesis was to explore, both numerically and theoretically, the potential of compressive sensing for the manipulation of large (audiovisual) databases. A particular objective was to propose learning techniques that can work on strongly compressed versions of a large corpus of data while maintaining the ability to infer essential characteristics of the distribution of the items in the corpus.

SEMAGRAMME Project-Team (section vide)

E-MOTION Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. Toyota Motors Europe

[Feb 2006 - Feb 2009] [Dec 2010 - Dec 2014]

The contract with Toyota Motors Europe is a joint collaboration involving Toyota Motors Europe, Inria and ProBayes. It follows a first successful short term collaboration with Toyota in 2005.

This contract aims at developing innovative technologies in the context of automotive safety. The idea is to improve road safety in driving situations by equipping vehicles with the technology to model on the fly the dynamic environment, to sense and identify potentially dangerous traffic participants or road obstacles, and to evaluate the collision risk. The sensing is performed using sensors commonly used in automotive applications such as cameras and lidar.

This collaboration has been extended for 4 years and Toyota provides us with an experimental vehicle Lexus equipped with various sensing and control capabilities. Several additional connected technical contracts have been signed also.

6.1.2. Renault

[Jan 2010 - Feb 2013]

This contract was linked to the PhD Thesis of Stephanie Lefèvre. The objective is to develop technologies for collaborative driving as part of a Driving Assistance Systems for improving car safety. Both vehicle perception and communications are considered in the scope of this study. An additional short-term contract (3 months) has also been signed in november 2012.

6.1.3. IRT-Nano Perfect (2012-2014, and 2015-2017)

Perfect is a project supported by ANR in the scope of the IRT (Technological Research Institute) Nano-electronic driven by the CEA (Nuclear Energy Agency). The partners of the project are the CEA-LETI LIALP laboratory, ST-Microelectronics and Inria. The goal of this project is to propose integrated solutions for “Embeeded Bayesian Perception for dynamic environments” and to develop integrated open platforms. During the first phase of the project (2012-2014), the focus is on the domain of transportation (both vehicle and infrastructure); health and smart home sectors will also be considered in the second phase (2015-2017).

6.2. Bilateral Grants with Industry

A Postdoc in Collaboration with the University of California Berkeley, Inria and Renault (Inria@SiliconValley fellowship) started in January 2013 on the topic of “Safety applications at road intersections for connected vehicle”.

6.3. National Initiatives

6.3.1. Inria Large Initiative Scale PAL (Personaly Assisted Living)

[Nov 2010 - Nov 2014]

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.

The Inria Project-Teams (IPT) participating in this Large-scale initiative action Personally Assisted Living (LSIA Pal) propose to work together to develop technologies and services to improve the autonomy and quality of life for elderly and fragile persons. Most of the associated project groups already address issues related to enhancing autonomy and quality of life within their work programs. This goal of this program is to unite these groups around an experimental infrastructure, designed to enable collaborative experimentation.

Working with elderly and fragile to develop new technologies currently poses a number of difficult challenges for Inria research groups. Firstly, elderly people cannot be classified as a single homogeneous group with a single behavior. Their disabilities may be classified as not just physical or cognitive, motor or sensory, but can also be classified as either chronic or temporary. Moreover, this population is unaccustomed to new technologies, and can suffer from both cognitive and social inhibitions when confronted with new technologies. None-the-less, progress in this area has enormous potential for social and financial impact for both the beneficiaries and their immediate family circle.

The spectrum of possible actions in the field of elderly assistance is large. We propose to focus on challenges that have been determined through meetings with field experts (medical experts, public health responsible, sociologists, user associations...). We have grouped these challenges into four themes: monitoring services, mobility aids, transfer and medical rehabilitation, social interaction services. These themes correspond to the scientific projects and expectations of associated Inria projects. The safety of people, restoring their functions in daily life and promoting social cohesion are all core motivations for this initiative.

e-Motion concentrates his work on mobility aids using the wheelchair.

6.3.2. ADT P2N

[Oct 2013 - Sept 2015]
The ADT P2N (Autonomous Navigation: From Perception to Navigation) involving e-Motion and Lagadic was accepted in 2012 for Lagadic and extended to emotion (with an IJD) in 2013. The ADT is dedicated to the development of a common software integrating perception and navigation methods developed in both teams. Demos will be done on various mobile robotic platforms such as wheelchairs, caddy...

FLOWERS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Advanced platform for Urban Mobility (PAMU)

Participants: David Filliat [correspondant], Emmanuel Battesti.

Development of extension of a planning algorithm on a autonomous electric car for Renault SAS. We improved a planning module in order to produce global plans to reach a goal specified in a digital map and to perform local reactive planning to avoid dynamic obstacles. This module is integrated in the PAMU autonomous vallet parking developed by Renault with several academic partners. The final demonstration of the system was made in october 2014.

7.2. Bilateral Grants with Industry

7.2.1. Development of an Contextual electronic copilot for driving assistance

Participants: David Filliat [correspondant], Alexandre Armand.

Financing of the CIFRE PhD grant of Alexandre Armand by Renault SAS with the goal of developping an Contextual electronic copilot for driving assistance based on the learning of the behavior of the driver.

7.2.2. Curiosity and visual attention

Participants: David Filliat [correspondant], Celine Craye.

Financing of the CIFRE PhD grant of Celine Craye by Thales S.A. with the goal of developing a mechanism of visual attention guiding the exploration of a robot.

7.2.3. Auto-Apprentissage Auto-Adaptable pour la compliance au traitement

Participants: Manuel Lopes [correspondant], Alexandra Delmas, Pierre-Yves Oudeyer, Benjamin Clement.

Financing of the CIFRE PhD grant of Alexandra Delmas by Itwell with the goal of developing a tool for self-learning for patients to improve their compliance to treatment.

HEPHAISTOS Team (section vide)

LAGADIC Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Robocortex

Participants: Souriya Trinh, Fabien Spindler, François Chaumette.

no. Inria Rennes 8492, duration: 13 months.

This contract with the Inria spin off company Robocortex started in March 2014. It is devoted to the visual tracking and 3D localization of some particular targets.

7.2. Bilateral Grants with Industry

7.2.1. Astrium EADS

Participants: Tawsif Gokhool, Patrick Rives.

no. Inria Sophia 7128, duration: 36 months.

The objective of this project that started in February 2012 is to investigate the general problem of visual mapping of complex 3D environments that evolve over time. This contract supports Tawsif Gokhool's Ph.D. (see Section 6.3.5).

7.2.2. ECA Robotics

Participants: Romain Drouilly, Patrick Rives.

no. Inria Sophia 7030, duration: 36 months.

This project started in May 2012. It aims at specifying a semantic representation well adapted to the problem of navigation in structured environment (indoors or outdoors). This contract is devoted to support the Cifre Convention between ECA Robotics and Inria Sophia Antipolis regarding Romain Drouilly's Ph.D.

RITS Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- *Valeo Group*: a very strong partnership is under reinforcement between Valeo and Inria. Several bilateral contracts were signed to conduct joint works on Driving Assistance. Valeo financed the PhD thesis of G. Trehard under the framework of Valeo internal project *"V50"* and is currently a major financing partner of the "GAT" international Chaire / JointLab. Technology transfer is also a major collaboration topic between RITS and Valeo.
- GAT JointLab: Inria is a main partner of this Joint Lab which is composed of Valeo, SAFRAN, Peugeot-Citroën, Inria, Armines and IFSTTAR. GAT will focus on the development of Automated driving architectures for implementation on real prototypes equipped with near-to-market sensors provided by the industrial partners.
- AKKA Technologies: a strong partnership was born as a result of Link & Go project funded by the Yvelines Department CG78. The Link & Go has become a common platform for development between Inria and AKKA. These two institutions are now partners in several research projects and established a roadmap for joint developments around the automatic full-by-wire driving.
- ROBOSOFT – EasyMile: Robosoft is a spin-off of Inria created in 1985. Partners in several national and European research programs, RITS and Robosoft share the same vision on the automated urban transportation needs and modalities. They coped on the design and development of the Cycab and are currently collaborating – together with EZ Mile – on the development of on-demand automated transportation based on automated shuttles; this includes technology transfer especially in laser-based navigation systems.
- *YAMAHA Motor Company (YMC)*: a MoU was signed in 2012 between YMC and RITS giving the two parties the framework to work on the *New generation of AGV*. The previous similar cooperation (2000-2010) led to a 750 000 Euros financing program that allowed the development of several AGV platforms. The new agreement settles the basis of more advanced collaboration more focused on machine intelligence and on the design of innovative electric AGV dedicated to mass transportation in urban areas. The EU-CityMobil-2 project is an ideal opportunity to maintain technical exchanges within the cooperation.
- AXTER Automation: RITS has signed a MoU with AXTER Technologies for the cooperation on the autonomous navigation in indoor environments for automated industrial vehicles.
- YoGoKo: This is the newly created spin-off of RITS team. It has been created by Thierry Ernst, previous researcher of RITS and the initiator of the telecommunications activities in the team. YoGoKo is specialized in the design and development of V2X telecommunication architectures and software based on recent IETF internet protocols (e.g., IPv6) and cooperative ITS norms of ISO/CEN/ETSI. RITS is equipping its mobile prototypes with YoGoKo's products and they are solid partners in French research programs.

AYIN Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts and Grants with Industry

6.1.1. Airbus D&S

Participants: Paula Craciun, Josiane Zerubia [PI].

Automatic object tracking on a sequence of images taken from a geostationary satellite. Contract #7363.

6.1.2. CNES Toulouse

Participants: Ihsen Hedhli, Josiane Zerubia [PI].

Multi-sensor change detection. Application to risk management after the Haiti earthquake. Contract #8361.

6.1.3. CNES Toulouse

Participants: Aurélie Boisbunon, Josiane Zerubia [PI].

Parameter estimation for automatic object change detection in a sequence of very high resolution optical images.

6.2. Consulting for Industry

Josiane Zerubia is a scientific consultant for the Galderma company.

LEAR Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. MSR-Inria joint lab: scientific image and video mining

Participants: Anoop Cherian, Zaid Harchaoui, Yang Hua, Cordelia Schmid, Karteek Alahari.

This collaborative project, which started in September 2008, brings together the WILLOW and LEAR project-teams with researchers at Microsoft Research Cambridge and elsewhere. It builds on several ideas articulated in the "2020 Science" report, including the importance of data mining and machine learning in computational science. Rather than focusing only on natural sciences, however, we propose here to expand the breadth of e-science to include humanities and social sciences. The project focuses on fundamental computer science research in computer vision and machine learning, and its application to archeology, cultural heritage preservation, environmental science, and sociology. Yang Hua is funded by this project.

7.2. MSR-Inria joint lab: structured large-scale machine learning

Participants: Julien Mairal, Zaid Harchaoui.

Machine learning is now ubiquitous in industry, science, engineering, and personal life. While early successes were obtained by applying off-the-shelf techniques, there are two main challeges faced by machine learning in the « big data » era : structure and scale. The project proposes to explore three axes, from theoretical, algorithmic and practical perspectives: (1) large-scale convex optimization, (2) large-scale combinatorial optimization and (3) sequential decision making for structured data. The project involves two Inria sites and four MSR sites and started at the end of 2013.

7.3. WayWay, OMB LABS

Participants: Matthijs Douze, Julien Mairal, Mattis Paulin, Jerome Revaud, Cordelia Schmid.

The collaboration with OMB Labs consisted of transferring technology developed at LEAR for large-scale image classification for the web application wayway.us. The company is developing a smartphone application for recommending restaurants and social places in US cities by exploiting image content from Instagram. Their system requires automatically classifying Instagram images into a few well-defined categories, "food", "people" and "atmosphere". Through a consulting project, with visits of engineers from OMB Labs, the team has helped them develop a full image classification pipeline to suit their industrial needs.

7.4. Xerox Research Center Europe

Participants: Matthijs Douze, Zaid Harchaoui, Mattis Paulin, Cordelia Schmid.

The collaboration with Xerox has been on-going since October 2009 with two co-supervised CIFRE scholarships (2009–2012; 2011-2014). Starting June 2014 we signed a third collaborative agreement for a duration of three years. The goal is to develop approaches for large-scale recognition and deep learning based image description.

LINKMEDIA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

CIFRE Ph. D. contract with Institut National de l'Audiovisuel (Bingqing Qu)

CIFRE Ph. D. contract with Institut National de l'Audiovisuel (Ludivine Kuznik)

CIFRE Ph. D. contract with Orange (Mohamed-Haykel Boukadida)

CIFRE Ph. D. contract with Technicolor (Himalaya Jain)

MAGRIT Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

The partnership with GE Healthcare started in 1993. In the past few years, it bore on the supervision of CIFRE PhD fellows on the topic of using a multi-modal framework and augmented reality in interventional neuroradiology. A new PhD thesis -Charlotte Delmas- started in April 2013 with the aim to perform 3D reconstruction of tools in interventional neuroradiology. Our goal is to help clinical gesture by providing the plysician with a better understanding of the relative positions of the tools and of the pathology.

MORPHEO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contract with Technicolor

A three year collaboration with Technicolor has started in 2011 and ended in 2014. The objective of this collaboration was to consider the capture and the interpretation of complex dynamic scenes in uncontrolled environments. A co- supervised PhD student (Abdelaziz Djelouah) was working on this subject and will defend his PhD in March 2015.

PERCEPTION Project-Team (section vide)

PRIMA Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Infrared Visual Sensors

PRIMA has worked with Schneider Electric on embedded image analysis algorithms for a new generation of far-infrared visual sensors. The objective is to develop an integrated visual sensor with very low power consumption. Such systems can be used to estimate temperature in different parts of a room, as well as to provide information about human presence and human activity.

SIROCCO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Contract with Astrium on compression of satellite images

Participants: Jeremy Aghaei Mazaheri, Christine Guillemot, Claude Labit.

- Title : Compression of satellite images.
- Research axis : § 6.3.2 .
- Partners : Astrium, Inria-Rennes.
- Funding : Astrium.
- Period : Oct.11-Sept.14.

This contract with Astrium addresses the problem of sparse representation and dictionary learning for efficient sparse coding of video signals captured from a geostationary satellite. The goal is to develop a compact spatio-temporal representation taking advantage of the high redundancy present in the video which is of very high resolution and characterized by low motion. Different methods for learning tree-structured dictionaries have been studied. The tree-structured dictionaries are well-tailored to the characteristics of the signals to be processed at each iteration of the greedy matching pursuit algorithms, while allowing efficient encoding of the produced sparse vectors. Adaptive tree-structures have been developed and the use of such dictionaries in HEVC-based intra coding has been investigated. First tests have also been carried out to known to which extent the learned dictionnaries can allow detecting the modulation transfer function (MTF) used to characterize the quality of electro-optical imaging systems on board remote sensing satellites.

7.2. Bilateral Grants with Industry

7.2.1. Contract with EutelSat on video traffic analysis

Participants: Laurent Guillo, Aline Roumy.

- Title : Bit rate statistical analysis of HEVC encoded video in a broadcast transmission.
- Partners : EutelSat, Inria-Rennes.
- Funding : EutelSat.
- Period : Aug.12-Mar.14.

This contract with EutelSat (starting in August 2012) is a consulting contract and aims at analyzing the variation of the video traffic, when the video is encoded by HEVC. Indeed, the main characteristic of satellite broadcasting, as proposed by Eutelsat, is to provide a nearly constant video quality, which is obtained by variable video traffic (bit rate). Then, to address this variability issue, statistical multiplexing is used to share the resource among the users. However, statistical multiplexing needs a precise analysis of this variability. In this contract, we therefore analyze this variability, when the video is compressed with the upcoming video compression standard HEVC.

7.2.2. CIFRE contract with Orange on Generalized lifting for video compression

Participants: Christine Guillemot, Bihong Huang.

- Title : Generalized lifting for video compression.
- Research axis : § 6.3.3 .
- Partners : Orange Labs, Inria-Rennes, UPC-Barcelona.
- Funding : Orange Labs.
- Period : Apr.2012-Mar.2015.

This contract with Orange labs. (started in April. 2012) concerns the PhD of Bihong Huang and aims at modelling the redundancy which remains in spatial and temporal prediction residues. The analysis carried out in the first year of the PhD has shown that this redundancy (hence the potential rate saving) is high. In 2013, different methods have been investigated to remove this redundancy, such as generalized lifting and different types of predictors. The generalized lifting is an extension of the lifting scheme of classical wavelet transforms which permits the creation of nonlinear and signal probability density function (pdf) dependent and adaptive transforms. This study is also carried out in collaboration with UPC (Prof. Philippe Salembier) in Barcelona.

7.2.3. CIFRE contract with Orange on 3D quality assessment

Participants: Darya Khaustova, Olivier Le Meur.

- Title : Objective Evaluation of 3D Video Quality.
- Research axis : § 6.1.3 .
- Partners : Orange Labs, Inria-Rennes.
- Funding : Orange Labs.
- Period : Dec.2011-Nov.2014.

This contract with Orange labs. (starting in Dec. 2011) concerns the PhD of Darya Khaustova and aims at developping a video quality metric for 3D content. The usage of 3D video is expected to increase in the next years. In order to ensure a good QoE (Quality of Experience), the 3D video quality must be monitored and accuratly measured. The goal of this thesis is to study objective measures suitable for estimating 3D video quality. A comparison with ground truth as well as with the state-of-the-art 2D metrics should be carried out. To be as effective as possible, the feature of the human visual system should be taken into account.

7.2.4. CIFRE contract with Technicolor on High Dynamic Range (HDR) video compression

Participants: Mikael Le Pendu, Christine Guillemot.

- Title : Floating point high dynamic range (HDR) video compression
- Research axis : § 6.3.4 .
- Partners : Technicolor, Inria-Rennes.
- Funding : Technicolor, ANRT.
- Period : Dec.2012-Nov.2015.

High Dynamic Range (HDR) images contain more intensity levels than traditional image formats, leading to higher volumes of data. HDR images can represent more accurately the range of intensity levels found in real scenes, from direct sunlight to faint starlight. The goal of the thesis is to design a visually lossless compression algorithm for HDR floating-point imaging data. The first year of the thesis has been dedicated to the design of a quantization method converting the floating point data into a reduced bit depth representation, with minimal loss. The method leads to a bit rate saving of 50% compared to the existing Adaptive LogLuv transform.

7.2.5. CIFRE contract with Technicolor on sparse modelling of spatio-temporal scenes

Participants: Martin Alain, Christine Guillemot.

- Title : Spatio-temporal analysis and characterization of video scenes
- Research axis : § 6.1.4 .
- Partners : Technicolor, Inria-Rennes.
- Funding : Technicolor, ANRT.
- Period : Oct.2012-Sept.2015.

A first CIFRE contract has concerned the Ph.D of Safa Cherigui from Nov.2009 to Oct.2012, in collaboration with Dominique Thoreau (Technicolor). The objective was to investigate texture and video scene characterization using models based on sparse and data dimensionality reduction techniques, as well as based on epitomes. The objective was then to use these models and methods in different image processing problems focusing in particular on video compression. While, the first PhD thesis has focused on spatial analysis, processing, and prediction of image texture, a second CIFRE contract (PhD thesis of Martin Alain) has started in Oct. 2012 to push further the study by addressing issues of spatio-temporal analysis and epitome construction, with applications to temporal prediction, as well as to other video processing problems such as denoising and super-resolution.

7.2.6. CIFRE contract with Thomson Video Networks (TVN) on Video analysis for HEVC based video coding

Participants: Nicolas Dhollande, Christine Guillemot, Olivier Le Meur.

- Title : Coding optimization of HEVC by using pre-analysis approaches.
- Research axis : § 6.3.3 .
- Partners : Thomson Video Networks, Univ. Rennes 1.
- Funding : Thomson Video Networks (TVN).
- Period : Nov.2012-Sept.2015.

This contract with TVN (started in Oct. 2012) concerns the PhD of Nicolas Dhollande and aims at performing a coding mode analysis and developing a pre-analysis software. HEVC standard is a new standard of compression including new tools such as advanced prediction modes. Compared to the previous standard H.264, HEVC's complexity is three to four times higher. The goal of this thesis is to infer the best coding decisions (prediction modes...) in order to reduce the computational complexity of HEVC thanks to a pre-analysis step. The pre-analysis is expected to provide useful estimates of local video characteristics which will then help selecting the prediction and transform partitions as well as a number of other parameters such as the quantization parameters or the prediction modes.

7.2.7. CIFRE contract with Envivio on LDR compatible HDR video coding

Participants: Christine Guillemot, David Gommelet, Aline Roumy.

- Title : LDR-compatible coding of HDR video signals.
- Research axis : § 6.3.3 .
- Partners : Envivio.
- Funding : Cifre Envivio.
- Period : Oct.2014-Sept.2017.

The goal of this Cifre contract is to design solutions for LDR-compatible coding of HDR videos. This involves the study of rate-distortion optimized tone mapping operators taking into account constraints of temporal coherency to avoid the temporal flickering which results from a direct frame-by-frame application of classical tone mapping operators. The goal is also to design a coding architecture which will build upon these operators, integrating coding tools tailored to the statistics of the HDR refinement signals.

STARS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- **Toyota europ**: this project with Toyota runs from the 1st of August 2013 up to 2017 (4 years). It aims at detecting critical situations in the daily life of older adults living home alone. We believe that a system that is able to detect potentially dangerous situations will give peace of mind to frail older people as well as to their caregivers. This will require not only recognition of ADLs but also an evaluation of the way and timing in which they are being carried out. The system we want to develop is intended to help them and their relatives to feel more comfortable because they know potentially dangerous situations will be detected and reported to caregivers if necessary. The system is intended to work with a Partner Robot (to send real-time information to the robot) to better interact with the older adult.
- **LinkCareServices**: this project with Link Care Services runs from 2010 upto 2014. It aims at designing a novel system for Fall Detection. This study consists in evaluating the performance of video-based systems for Fall Detection in a large variety of situations. Another goal is to design a novel approach based on RGBD sensors with very low rate of false alarms.

WILLOW Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. MSR-Inria joint lab: Image and video mining for science and humanities (Inria)

Participants: Leon Bottou [MSR], Ivan Laptev, Maxime Oquab, Jean Ponce, Josef Sivic, Cordelia Schmid [Inria Lear].

This collaborative project brings together the WILLOW and LEAR project-teams with MSR researchers in Cambridge and elsewhere. The concept builds on several ideas articulated in the “2020 Science” report, including the importance of data mining and machine learning in computational science. Rather than focusing only on natural sciences, however, we propose here to expand the breadth of e-science to include humanities and social sciences. The project we propose will focus on fundamental computer science research in computer vision and machine learning, and its application to archaeology, cultural heritage preservation, environmental science, and sociology, and it will be validated by collaborations with researchers and practitioners in these fields.

In October 2013 a new agreement has been signed for 2013-2016 with the research focus on automatic understanding of dynamic video content. Recent studies predict that by 2018 video will account for 80-90% of traffic on the Internet. Automatic understanding and interpretation of video content is a key enabling factor for a range of practical applications such as organizing and searching home videos or content aware video advertising. For example, interpreting videos of “making a birthday cake" or “planting a tree" could provide effective means for advertising products in local grocery stores or garden centers. The goal of this project is to perform fundamental computer science research in computer vision and machine learning in order to enhance the current capabilities to automatically understand, search and organize dynamic video content.

7.2. Google: Learning to annotate videos from movie scripts (Inria)

Participants: Josef Sivic, Ivan Laptev, Jean Ponce.

The goal of this project is to automatically generate annotations of complex dynamic events in video. We wish to deal with events involving multiple people interacting with each other, objects and the scene, for example people at a party in a house. The goal is to generate structured annotations going beyond simple text tags. Examples include entire text sentences describing the video content as well as bounding boxes or segmentations spatially and temporally localizing the described objects and people in video. This is an extremely challenging task due to large intra-class variation of human actions. We propose to learn joint video and text representations enabling such annotation capabilities from feature length movies with coarsely aligned shooting scripts. Building on our previous work in this area, we aim to develop structured representations of video and associated text enabling to reason both spatially and temporally about scenes, objects and people as well as their interactions. Automatic understanding and interpretation of video content is a key-enabling factor for a range of practical applications such as content-aware advertising or search. Novel video and text representations are needed to enable breakthrough in this area.