



RESEARCH CENTER

FIELD

Perception, Cognition, Interaction

Activity Report 2012

Section Contracts and Grants with Industry

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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 Verbatim Analysis (license agreement and “CIFRE” PhD, see section 4.3), Lingua et Machina (DTI-funded engineer, see section 4.4), Viavoo, and Diadeis (the “Investissements d’Avenir” project PACTE has started in 2012, see section 4.5).

METISS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Contract with Canon Research Centre France SAS

Participants: Emmanuel Vincent, Joachim Thiemann, Nancy Bertin, Frédéric Bimbot.

Duration: 1.5 years (2012–2013). Partner: Canon Research Centre France SAS

This contract aims at transferring some of the research done within Metiss to products developed by Canon Inc.

7.1.2. Contract with Studio Maïa

Participants: Nancy Bertin, Frédéric Bimbot, Jules Espiau, Jérémy Paret, Emmanuel Vincent.

Duration: 3 years (2012–2014). Partners: Studio Maïa (Musiciens Artistes Interprètes Associés), Imaging Factory

This contract aims at transferring some of the research done within Metiss towards new services provided by Maïa Studio.

More specifically, the main objective is to adapt source separations algorithms and some other advanced signal processing techniques elaborated by Metiss 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.

PAROLE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Introduction

Our policy in terms of technological and industrial partnership consists in favoring contracts that quite precisely fit our scientific objectives. We are involved in an ANR project about audiovisual speech synthesis, another about acoustic-to-articulatory inversion of speech (ARTIS), another about the processing of articulatory data (DOCVACIM) and in a national evaluation campaign of automatic speech recognition systems (ETAPE). We also coordinated until January 2009 the 6th PCRD project ASPI about acoustic-to-articulatory inversion of speech, and the Rapsodis ARC until october 2009.

In addition, we are involved in several regional projects.

7.2. Regional Actions

7.2.1. CPER MISN TALC

The team is involved in the Contrat Plan Etat-Région (CPER) contract. The CPER MISN TALC, for which Christophe Cerisara is co-responsible, with Claire Gardent, have the objective to leverage collaborations between regional academic and private partners in the domain of Natural Language Processing and Knowledge engineering. The TALC action involves about 12 research teams and 40 researchers for a budget of about 240,000 euros per year.

In addition to the co-management of this project, our team is also involved in scientific collaborative operations about text-to-speech alignment, in collaboration with the ATILF laboratory. Automatic alignment procedures are available, and a first version of speech data prosodic structuration has been developed.

7.3. National Contracts

7.3.1. ADT JSnoori

JSnoori ADT (2011-2012) is dedicated to porting main functions of WinSnoori in Java and the integration of new facilities targeting language learning. The main objective is to offer functions enabling the development of feedback for foreign language learning and more precisely the mastery of prosody.

This year the architecture has been changed to comply to the MVC (Model View Controller) model. This makes the management of interactions easier and this clearly separates speech processing algorithms from interactions. In addition forced alignment facilities and phonetic edition tools have been integrated for French and English. They enable the segmentation of sentences uttered by learners, and the annotation with international phonetic alphabet (IPS).

Preliminary versions of diagnosis and feedback of prosody have been incorporated for English (see [6.1.6.1](#)).

7.3.2. ANR ARTIS

This contract started in January 2009 in collaboration with LTCI (Paris), Gipsa-Lab (Grenoble) and IRIT (Toulouse). Its main purpose is the acoustic-to-articulatory inversion of speech signals. Unlike the European project ASPI the approach followed in our group will focus on the use of standard spectra input data, i.e. cepstral vectors. The objective of the project is to develop a demonstrator enabling inversion of speech signals in the domain of second language learning.

This year the work has focused on the development of the inversion from cepstral data as input. We particularly worked on the comparison of cepstral vectors calculated on natural speech and those obtained via the articulatory to acoustic mapping. Bilinear frequency warping was combined with affine adaptation of cepstral coefficients. These two adaptation strategies enable a very good recovery of vocal tract shapes from natural speech. The second topic studied is the access to the codebook. Two pruning strategies, a simple one using the spectral peak corresponding to F2 and a more elaborated one exploiting lax dynamic programming applied on spectral peaks enable a very efficient access to the articulatory codebook used for inversion.

7.3.3. ANR ViSAC

This ANR Jeunes Chercheurs started in 2009, in collaboration with Magrit group. The main purpose of ViSAC (Acoustic-Visual Speech Synthesis by Bimodal Unit Concatenation) is to propose a new approach of a text-to-acoustic-visual speech synthesis which is able to animate a 3D talking head and to provide the associated acoustic speech. The major originality of this work is to consider the speech signal as bimodal (composed of two channels acoustic and visual) "viewed" from either facet visual or acoustic. The key advantage is to guarantee that the redundancy of two facets of speech, acknowledged as determining perceptive factor, is preserved.

Currently, we designed a complete system of the text to acoustic-visual speech synthesis based on a relatively small corpus. The system is using bimodal diphones (an acoustic component and a visual one) and it is using unit selection techniques. Although the database for the synthesis is small, however the first results seem to be very promising. The developed system can be used with a larger corpus. We are trying to acquire/analyze an 1-2 hours of audiovisual speech.

Currently, we are mainly evaluating the system using both subjective and objective perceptual evaluation.

7.4. International Contracts

7.4.1. CMCU - Tunis University

This cooperation involves the LSTS (Laboratoire des systèmes et Traitement du Signal) of Tunis University headed by Prof. Nouredine Ellouze and Kais Ouni. This new project involves the investigation of automatic formant tracking, the modelling of peripheral auditory system and more generally speech analysis and parameterization that could be exploited in automatic speech recognition.

7.4.2. The Oesovox Project 2009-2011: 4 international groups associated...

It is possible for laryngectomees to learn a substitution voice: the esophageal voice. This voice is far from being natural. It is characterized by a weak intensity, a background noise that bothers listening, and a low pitch frequency. A device that would convert an esophageal voice to a natural voice would be very useful for laryngectomees because it would be possible for them to communicate more easily. Such natural voice restitution techniques would ideally be implemented in a portable device. In order to answer the Inria Euromed 3+3 Mediterranean 2006 call, the Inria Parole group (Joseph Di Martino, LORIA senior researcher, Laurent Pierron, Inria engineer and Pierre Tricot, Associated Professor at ENSEM) associated with the following partners:

- **Spain:** Begoña Garcia Zapirain, Deusto University (Bilbao-Spain), Telecommunication Department, PAS-"ESOIMPROVE" research group.
- **Tunisia:** Sofia Ben Jebara, TECHTRA research group, SUP'COM, Tunis.
- **Morocco:** El Hassane Ibn-Elhaj, SIGNAL research group, INPT, Rabat.

This project named LARYNX has been subsidized by the Inria Euromed program during the years 2006-2008. Our results have been presented during the Inria 2008 Euromed colloquium (Sophia Antipolis, 9-10 October 2008). During this international meeting, The French Inria institute decided to renew our project with the new name "OESOVOX". This new project will be subsidized during the years 2009-2011.

In the framework of the European COADVISE-FP7 program, two PhD students have assigned to the Euromed 3+3 Oesovox project. These students are, Miss Fadoua Bahja from INPT-Rabat (Morocco) whose PhD thesis title is "Detection of F0 in real-time for audio: application to pathological voices" and Mr. Ammar Werghi from SUP'COM-Tunis (Tunisia) whose PhD thesis title is "Voice conversion techniques applied to pathological voice repair". The activity reports of these two students for the year 2009 is described in [6.1.5](#) .

SEMAGRAMME Team (section vide)

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>.

IMAGINE Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts and Grants with Industry

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

Participants: Jean-Claude Léon, Stefanie Hahmann.

Cifre PhD in partnership with EADS IW 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. Some results from the homology computation topic may be used in the present context. An ongoing publication should address the description of the various stages of a component shape transformation in the context of assemblies.

7.1.2. HAPTIHAND technology transfer project (Inria-HAPTION-Arts et Métiers ParisTech) (10/2012-12/2013)

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. 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, a research study about the optimal use of the device as well as a project management task.

IN-SITU Project-Team (section vide)

MANAO Team (section vide)

MAVERICK Team (section vide)

MIMETIC Team (section vide)

MINT Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. I-Lab Idées-3com (2009-2012)

Participants: Clément Moerman, Samuel Degrande, Damien Marchal, Laurent Grisoni [correspondant].

This year, our join research program with the small company Idées-3com is terminating. This program is supported by Inria, with a 3 year young engineer contract. During this join project, we have proposed interaction systems that is based on mobile phone, library for gestural interaction and a new navigation technique for fast and intuitive visiting of 3D virtual world [20].

POTIOC Team (section vide)

REVES Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Grants with Industry

6.1.1. Industrial Contracts and Donations

6.1.1.1. Autodesk

Participants: Pierre-Yves Laffont, Adrien Bousseau, George Drettakis.

We signed a technology transfer agreement with Autodesk RID technology on single-lighting condition intrinsic images. Autodesk has offered a significant research donation to REVES in support of our work on intrinsic images. Autodesk has also donated several licenses of Maya, 3DS Max and SketchBookPro.

6.1.1.2. Adobe

Participants: Pierre-Yves Laffont, Adrien Bousseau, George Drettakis.

In the context of our collaboration with Adobe (project with S. Paris and F. Durand from MIT), we have received a cash donation in support of our research and software donations of Adobe CS6 Creative Suite.

VR4I Team (section vide)

AXIS Project-Team (section vide)

DAHU Project-Team (section vide)

DREAM Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. *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). 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 was first implemented using using decision trees, the aim being to characterize the faults and consequently update the global knowledge base and its distributed instances. This year, we studied an incremental version of this learning step in order to get an on-line process [20]. This means being able to learn new faults characterizations and add new preventive rules, and also forget no longer needed ones.

7.2. National Initiatives

7.2.1. *SACADEAU-APPEAU: Decision-aid to improve streamwater quality*

Participants: Marie-Odile Cordier, Véronique Masson.

The SACADEAU project (Système d'Acquisition de Connaissances pour l'Aide à la Décision pour la qualité de l'EAU - Knowledge Acquisition System for Decision-Aid to Improve Streamwater Quality) was funded by INRA (French institute for agronomy research) from October 2002 to October 2005. The main partners were from INRA (SAS from Rennes and BIA from Toulouse) and from IRISA.

We were then involved in a new project, named APPEAU and funded by ANR/ADD, which started in February 2007 and ended in december 2011. The APPEAU project aimed at studying which politics, for which agronomic systems, are best adapted to improve water management. It includes our previous partners as well as new ones, mainly from INRA(http://www.agir.toulouse.inra.fr/agir/index.php?option=com_content&view=article&id=62&Itemid=134). A synthesis paper has been published in 2012 [5].

7.2.2. *ACASSYA: Supporting the agro ecological evolution of breeding systems in coastal watersheds*

Participants: Marie-Odile Cordier, Véronique Masson, René Quiniou.

The ACASSYA project (ACcompagner l'évolution Agro-écologique deS SYstèmes d'élevage dans les bassins versants côtiers) is funded by ANR/ADD. It started at the beginning of 2009 and will end in june 2013. The main partners are our colleagues from INRA (SAS from Rennes. One of the objectives is to develop modeling tools supporting the management of ecosystems, and more precisely the agro ecological evolution of breeding systems in coastal watersheds. In this context, the challenge is to transform existing simulation tools (as SACADEAU or TNT2 into decision-aid tools, able to answer queries or scenarios about the future evolution of ecosystems. (http://www.rennes.inra.fr/umrsas/programmes/acassya_accompagner_l_evolution_agro_ecologique_des_systemes_d_elevage))

7.2.3. PayOTe-Network: characterizing agricultural landscapes via data mining

Participants: Thomas Guyet, René Quiniou.

The PAYOTE project (Paysage Ou Territoire) was initially funded by AIP INRA/INRIA. It started at the end of 2010 and will end by the end of 2012.. The project is turning into a network mainly funded by INRA. This network still associates Inria Teams (Orpailleur and Dream) with INRA Team (UBIA, MIAJ and SAD-Paysage).

One of the objectives of the PAYOTE network is to provide tools to generate “realistic” agricultural landscapes. This kind of generator are expected by expert to study the impact of the landscape on agro-ecological systems. The main approach of this network is to use data mining to automatically construct a neutral model of a landscape. Then, the model of a landscape may be used to generate new landscapes with same spatial properties.

In this context, the challenge is to develop spatio-temporal data mining algorithms to analyse the spatial organization of agricultural landscapes.

EXMO Project-Team (section vide)

GRAPHIK Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. ABES

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

Collaboration with ABES. Funding of half a PhD grant (Léa Guizol, started in October 2011). See Sect. 6.3 .

7.2. CTFC

Participants: Patrice Buche, Jérôme Fortin, Awa Diattara.

We have initiated a national collaboration with the technical center of Comtois' cheese (CTFC : Centre Technique des Fromages Comtois). The objective of this collaboration is to design and test a platform for expert knowledge management. This will allow us to validate the integration of our theoretical tools on a new real-world application and strengthen GraphIK's involvement in agronomy applications. A master degree internship in collaboration with CTFC is done by Awa Diattara (University Gaston Berger of Saint-Louis, Sénégal).

7.3. INA

Participants: Michel Leclère, Michel Chein, Marie-Laure Mugnier, Akila Ghersedine.

Funding of a PhD CIFRE-grant (Akila Ghersedine, started in May 2012). The objective of the collaboration is to propose automatic (or semi-automatic) technics for enriching authorities. An authority is a record that describes a named entity used in document metadata (e.g. a person, a domain). The elaboration of a solution requires addressing different problems: extraction of knowledge from textual metadata, entity resolution which is the core problematic of the Akila Ghersedine's thesis subject, and authority fusion.

MAIA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

Participants: Arsène Fansi Tchango, Olivier Buffet, Vincent Thomas, Alain Dutech.

Arsène Fansi Tchango has currently a CIFRE grant for his PhD "Multi-Camera Tracking in Partially Observable Environment". This CIFRE is the result of the collaboration between Thales THERESIS and Inria Nancy Grand-Est (Section [6.1.5](#)).

MOSTRARE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. *QuiXProc: Inria Transfer Project with Innovimax (2010-2012)*

Participants: Denis Debarbieux, Joachim Niehren [correspondent], Tom Sebastian.

QuiXProc is an Inria transfer project with Innovimax S.A.R.L in Paris, on the integration of XPath streaming algorithms into XProc, the XML coordination language of the W3C.

7.1.2. *Music Story*

Participants: Fabien Torre, Mikaela Keller [correspondent], Guillaume Bagan.

The MusicStory project is a transfer project with MusicStory, a company collecting musical metadata from heterogeneous sources. The project entails the design of automated data deduplication and field inference algorithms suited for MusicStory needs.

7.2. Bilateral Grants with Industry

7.2.1. *Cifre Xerox (2009-2012)*

Participants: Jean-Baptiste Faddoul, Rémi Gilleron, Fabien Torre [correspondent].

Gilleron and Torre continue supervising the PhD thesis (Cifre) of Jean-Baptiste Faddoul together with B. Chidlovski from the Xerox's European Research Center (XRCE).

7.2.2. *Cifre Innovimax (2010-2013)*

Participants: Tom Sebastian, Joachim Niehren [correspondent].

Niehren continue supervising the PhD thesis (Cifre) of Tom Sebastian on streaming algorithms for XSLT with M. Zergaoui from INNOVIMAX S.A.R.L. in Paris.

7.2.3. *Cifre SAP (2011-2014)*

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

Garriga, Gilleron and Tommasi supervise the PhD thesis (Cifre) of Thomas Ricatte together with Yannick Cras from SAP.

OAK Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

A collaboration grant is ongoing with DataPublica, which started based on our common work on Linked Data for Digital Cities.

ORPAILLEUR Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. The BioIntelligence Project

Participants: Mehwish Alam, Yasmine Assess, Aleksey Buzmakov, Adrien Coulet, Marie-Dominique Devignes, Amedeo Napoli [contact person], 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 running in the Orpailleur team. A first thesis is related to the study of possible combination of mining methods on biological data. The mining methods which are considered here are based on FCA and RCA, itemset and association rule extraction, and inductive logic programming. These methods have their own strengths and provide different special capabilities for extending domain ontologies. A particular attention will be paid to the integration of heterogeneous biological data and the management of a large volume of biological data while being guided by domain knowledge lying in ontologies (linking data and knowledge units). Practical experiments will be led on biological data (clinical trials data and cohort data) also in accordance with ontologies lying at the NCBO BioPortal.

A second thesis is based on an extension of FCA involving Pattern Structures on Graphs. The idea is to be able to extend the formalism of pattern structures to graphs and to apply the resulting framework on molecular structures. In this way, it will be possible to classify molecular structures and reactions by their content. This will help practitioners in information retrieval tasks involving molecular structures or the search for particular reactions. In addition, an experiment was also carried out in the combination of supervised (distance-based clustering) and unsupervised learning (FCA) methods for the prediction of the configuration of inhibitors of the c-Met protein (which is very active in cancer).

In addition, a forthcoming thesis will be in concern with ontology re-engineering in the domain of biology. The objective is consider the content of the BioPortal ontologies (<http://bioportal.bioontology.org/>) and to design formal contexts and associated concept lattices which will become supports for ontological schemes. Moreover, this ontological schema will be completed thanks to external resources such as Wikipedia and domain knowledge as well. The global idea is to get definitions and thus classification capabilities for atomic or primitive concepts.

7.2. The Quaero Project

Participants: Victor Codocedo [contact person], Ioanna Lykourantzou, 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 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 participates in the task called “Formal Representation of Knowledge for Guiding Recommendation”, whose objectives are to define methods and algorithms for building a “discovery engine” guided by domain knowledge and able to recommend a user some content to visualize. Such a discovery engine has to extend capabilities of usual recommender systems with a number of capabilities, e.g. to select among a huge amount of items (e.g. movie, video, music) those which are of interest for a user according to a given profile. In addition, the discovery engine should take into account contextual information that can be of interest such as news, space location, moment of the day, actual weather and weather forecast, etc. This contextual information changes within time and extracted information has to be continuously updated. Finally, the system has to be able to justify or explain the recommendations.

A thesis takes place in the context of the Quaero project. At the moment, document annotation is especially studied for enhancing recommendation but also information retrieval. Information retrieval guided by domain knowledge can be used for selecting resources of interest for these two tasks. Then knowledge discovery based on Formal Concept Analysis can be used for extracting patterns of interest w.r.t. the context and for enriching the domain and contextual knowledge base.

Finally, the discovery process has to be able to act as a classifier and as an inference engine at the same time for reasoning and classifying elements for recommendation and retrieval.

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 Axalto, recently merged with Gemplus to form 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. Meanwhile, we are developing partnerships with SMEs capable of building ad-hoc hardware prototypes conforming to our own design. We cooperate also with Santeos, an Atos Origin company developing software platforms of on-line medical services. Santeos is member of the consortium selected by the French Ministry of Health to host the French DMP (the national Personal Medical Folder initiative). This cooperation helps us tackling one of our targeted applications, namely the protection of medical folders.

7.2. DMSP Yvelines District grant (Nov 2010 - Apr. 2012)

Partners: Inria-SMIS (coordinator), Gemalto, UVSQ, Santeos
SMIS funding : 75k€

http://www-smis.inria.fr/_DMSP/accueil.php

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 (see above). It is currently experimented in the context of a medical-social network providing care and services at home for elderly people. The experiment in the field started in September 2011 with a targeted population of 120 volunteer patients and practitioners in the Yvelines district.

WAM Project-Team (section vide)

WIMMICS Team

7. Bilateral Contracts and Grants with Industry

7.1. Alcatel Lucent Bell

We initiated a Research Contract (CRE) and CIFRE PhD Thesis (2011-2013) on Social objects, object-centered sociality, and object-centered social networks to propose mobile context-based notification application in a semantic and pervasive Web. This work will explore spreading algorithms in typed graphs.

7.2. SAP

We have a PhD Thesis (Cifre) with SAP Research on *Usage semantics of analytics and Business Intelligence tools*.

ZENITH Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Data Publica (2010-2013)

Participants: Emmanuel Castanier, Patrick Valduriez.

Data Publica (<http://www.data-publica.com>) is a startup providing a web portal for open data which can be public, private, free or charged. We collaborate with Data Publica through our WebSmach tool on technologies for automatic schema extraction and matching from high numbers of data sources. A first contribution has been the development of an Excel extraction component based on machine learning techniques.

COPRIN Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Airbus France

Participant: Yves Papegay.

To improve the production of numerical (flight) simulators from models of aerodynamics, Airbus France is interested in methods and tools like those described in 6.3.1 .

Following the contracts signed in 2003, 2005 and 2007 with the aircraft maker, and a consulting contract in 2008 to study the possible development of an industrial tool, we have initiated in 2009 a 2-years collaboration (extended in 2012) to enhanced the fonctionnalities and performances of the existing pieces of software belonging to Airbus and to turn them into a prototype that integrate and showcase our results.

Following a first transfer agreement signed in 2010, and another contract licensing to Airbus a second version of this prototype in 2011, a last agreement to be signed in November 2012 will license the final and tested version [34].

7.2. Thales Alenia Space

Participants: David Daney [correspondant], Thibault Gayral, Jean-Pierre Merlet.

Thales Alenia Space, in partnership with the Coprin team, is studying a new concept of active space telescope. Based on a parallel architecture, its structure allows not only the telescope deployment in space but also the accurate positioning of the secondary mirror with respect to the primary one in order to improve the provided images quality. The deployment and re-positioning concepts were validated thanks to a first prototype, and the telescope performances improvement is currently under study. A first study brought to light the front-seat role of mechanical joints on the structure accuracy. However, in order to deal with the required optical accuracy and space constraints, those mechanical joints had to be replaced by flexible ones. A new prototype was then designed and built in order to validate its ability to ameliorate its images quality using flexible joints. The goal of this project is to self-calibrate the mechanical structure of the telescope: using only proprioceptive information, parameters of the robot model will be identified. Thus, a space telescope based on this concept will be able to reach its final orbit, and then to improve its image accuracy thanks to an autonomous procedure.

7.3. Collaboration with ADEME: carbon value and carbon tax in the context of renewable energies deployment

Participants: Odile Pourtallier, Mireille Bossy.

Started in January 2009 and finished in October 2012, this collaboration financed by the French Environment and Energy Management Agency (ADEME), involves the Centre for Applied Mathematics (CMA), at Mines ParisTech, COPRIN and TOSCA teams at Inria. It focuses on a short term carbon value derived from the so-called financial *carbon market*, the European Union Emission Trading Scheme (EU ETS), which is a framework for GHG emissions reduction in European industry.

The objective of this project is to study the compatibility and complementarity of a carbon tax and a target for renewable energy deployment [32], see also Inria -TOSCA Team report.

E-MOTION Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. 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 is 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. PROTEUS

[November 2009 - October 2013]

PROTEUS (“Robotic Platform to facilitate transfer between Industries and academics”) is an ANR project involving 6 industrial and 7 academic partners. This projects aims to develop a software platform which helps to share methods and softwares between academics and industries in the field of mobile robotics.

The project works on three main aspects :

- Specification of different scenarios and its associated formalism.
- Definition of a domain specific language (DSL) to specify and execute the given scenarios.
- Setting up 4 robotic challenges to evaluate the capacity and the usability of the platform.

The contribution of *e-Motion* to PROTEUS is first to provide its expertise on mobile robotics to develop the DSL and next to provide a simulation environment with its platform “CycabTK”.

Juan Lahera-Perez has been recruited as engineer to work on this project with Amaury Nègre.

6.1.4. Delta Drone

[9 May 2012 - 9 November 2012]

This is a collaboration between our lab and the company Delta Drone. The goal of this collaboration is the exploitation of our competences in visual inertial navigation in order to make a drone able to perform autonomous navigation in GPS denied environment. This would have a strong impact on many civilian applications (e.g., surveillance, rescue mission, building inspection, etc.) During 2012, our effort has been focused on the first important step which must be accomplished in order to perform any task: the hovering. To this regard, we introduced a new method to localize a micro aerial vehicle (MAV) in GPS denied environments and without the usage of any known pattern. This makes possible to perform hovering in an unknown and GPS denied environment. The method has successfully been implemented on the platform available in our lab. This is a *Pelican* from *Ascending Technologies* equipped with an Intel Atom processor board (1.6 GHz, 1 GB RAM).

6.1.5. 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 “Embedded 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).

6.1.6. FUI Permobilier (2013-2015) – submitted

Permobilier is a project submitted to the 15th FUI call for project. The consortium of the project puts together research labs, large industrial partners and local small and medium companies. The objective of Permobilier is to create electronic solutions (both hardware and software) for an embedded system for mobile perception in dynamic environments. This system is intended to anticipate potential collisions which may occur for the mobile platform (car, bus, aerial drone. . .).

The starting point is the current perception system developed in the e-Motion team for automotive applications, which is currently implemented on a standard PC (CPU+GPU) architecture. Permobilier intends to improve the perception capability and to reduce the size, cost and electrical consumption of the system through the integration on the mobile technologies. A first stage consists in using current mobile technologies, while the second stage proposes to develop an innovative mobile board incorporating multiple mobile CPU/GPU processors. Demonstrators based on real mobile platforms (bus and aerial drone) will be developed to assess the realism and the efficiency of the approach developed in the project.

The partners of the project include both experts in software (Inria, Probayes), hardware (CEA LETI, Calao systems, ST-Ericsson), and final users of the technology (Delta-Drone, SEMITAG).

6.2. National Initiatives

6.2.1. Inria Large Initiative Scale PAL (Personally Assisted Living

[Nov 2009 - Nov 2013]

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. European Initiatives

6.3.1. Major European Organizations with which you have followed Collaborations

Department of Electrical & Computer Engineering: Univeristy of Thrace, Xanthi (GREECE)

Subject: 3D coverage based on Stochastic Optimization algorithms

BlueBotics: BlueBotics Company, Lausanne (Switzerland)

Subject: Implementation of self-calibration strategies for wheeled robots and SLAM algorithms for industrial purposes

Autonomous System laboratory: ETHZ, Zurich (Switzerland)

Subject: Vision and IMU data Fusion for 3D navigation in GPS denied environment.

6.4. International Initiatives

6.4.1. “ict-PAMM”

[September 2011- September 2013]

ict-PAMM is an ICT-ASIA project accepted in 2011 for 2 years. It is funded by the French Ministry of Foreign Affairs and Inria. 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. French partners are Inria-emotion from Grenoble, Inria-IMARA from Rocquencourt and Institut Blaise Pascal from Clermont-Ferrand. Asian Partners are IRA-Lab from Taiwan, ISRC-SKKU from Suwon in Korea, ITS-Lab from Kumamoto in Japan and Mica Institute from Hanoi in Vietnam.

6.4.2. “Predimap”

[September 2011- September 2013]

Predimap is an ICT-ASIA project accepted in 2011 for 2 years. It is funded by the French Ministry of Foreign Affairs and Inria. This project aims at conducting common research activities in the area of perception in road environment. The main objective is the simultaneous use of local perception and Geographical Information Systems (GIS) in order to reach a global improvement in understanding road environment. Thus the research topics included in the project are: local perception, precise localization, map-matching and understanding of the traffic scenes. French partners are Inria-emotion from Grenoble, Heudiasyc team from CNRS/UTC, and Matis team from IGN. Foreign partners are Peking University and Shanghai Jiao Tong University in China, CSIS lab from Tokyo University in Japan and AIT Geoinformatics Center in Thailand.

6.4.3. “PRETIV”

[November 2011- October 2014]

Multimodal Perception and REasoning for Transnational Intelligent Vehicles" (PRETIV) is a three-year ANR project accepted in the framework of the Blanc International II Programme with participants from France (e-Motion of Inria, Heudiasyc of CNRS, PSA Peugeot Citroen DRIA in Velizy) and China (Peking University, PSA Peugeot Citroen Technical Center in Shanghai). The project aims at developing of an online multimodal perception system for a vehicle and offline reasoning methods, dealing with incompleteness and uncertainties in the models and sensor data, as well as at conducting experiments in typical traffic scenarios in France and China to create an open comparative dataset for traffic scene understanding. The perception system will incorporate vehicle localization, mapping of static environmental objects, detecting and tracking of dynamic objects in probabilistic frameworks through multimodal sensing data and knowledge fusion. The reasoning methods are based on sensor data to learn semantics, activity and interaction patterns (vehicle - other objects, vehicle - infrastructure) to be used as a priori information to devise effective online perception algorithms toward situation awareness. The comparative dataset will contain experimental data of typical traffic scenarios with ground-truth, which will be used to learn country-specific traffic semantics and it will be open to the public.

6.4.4. Visits of International Scientists

In 2011, M. Perrollaz went to Ohio Northern University for a short term research contract. From this collaboration, two papers were published in 2012: [24] and [33].

In 2012, Dimitrios Kanoulas, PhD Student at Northeastern University (Boston, USA) came at Inria for 4 months, within the framework of the REUSSI program.

6.4.4.1. Internship

Procopio Silveira-Stein, PhD at LAR (Laboratório de Automação e Robótica) at UA (Universidade de Aveiro) is in our team for november 2011 to july 2012.

6.4.5. Participation In International Programs

Submission of a international program with Taiwan called I-Rice. Partners for this proposition of an international center are IRA-lab (Taiwan university), LAAS, Inria and UPMC. Topics are related to Cognitive Systems and Robotics. Project under evaluation (hearing step).

Submission of an ANR Blanc GeoProb in collaboration with the spinoff Probayes (Mexico). Project on complementary list.

FLOWERS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. *Fondation Cartier pour l'Art Contemporain*

The team has been collaborating with Fondation Cartier pour l'Art Contemporain in the context of the elaboration of the exhibition "Mathematical: A Beautiful Elsewhere" (<http://fondation.cartier.com>), to be held from October 2011 to March 2012, as well as with artist David Lynch, to build the robotic installation/experiment Ergo-Robots/FLOWERS Fields. This robotic installation illustrates, as well as allows to experiment in a realistic setup on the long term, computational models of curiosity-driven learning, human-robot interaction and language formation. Fondation Cartier participated to the funding of this experiment/installation. A dedicated web page is available at: <http://flowers.inria.fr/ergo-robots.php>

7.1.2. *Honda Research Institute USA Inc.*

Alexander Geppert is collaborating with Honda Research Institute USA Inc. to implement and evaluate a real-time pedestrian detection and pose classification system with the goal of creating an industrial product in the coming years. Particular aspects of the project are robustness and real-time capability. Robustness is approached by the use of state-of-the-art image feature representations, a sophisticated hierarchy of linear and non-linear support vector classifiers, and dedicated tracking algorithms. Real-time capability is ensured by running the time-critical parts of the whole-image search on a GPU. A particular focus of the project is the use of synthetically rendered pedestrian images for detector training, which ameliorates the problem of insufficient training data. This work has been submitted to the "International Conference On Computer Vision and Pattern Recognition" (CVPR) as well as the "Intelligent Vehicles Symposium" (IV). Honda Research Institute USA Inc. support Alexander Geppert by financing a post-doctoral researcher at ENSTA ParisTech during one year, grant volume: 50.000USD.

7.1.3. *Robert Kostal GmbH*

Alexander Geppert has collaborated with Robert Kostal GmbH, Dortmund (Germany) on the subject of real-time pose recognition from 3D camera data. This project was conducted mainly through an internship student financed by Robert Kostal GmbH.

7.1.4. *Honda Research Institute Europe GmbH*

Alexander Geppert and Louis-Charles Caron have collaborated with Honda Research Institute Europe GmbH, Offenbach (Germany) on the subject of real-time shape recognition for robotics. This project was conducted through an internship student financed by Honda Research Institute Europe GmbH, and through the visit of Louis-Charles Caron to Honda Research Institute Europe GmbH in summer 2012.

7.1.5. *Pal Robotics*

Freek Stulp is continuing his collaboration with Pal Robotics in Barcelona to implement and evaluate the use of Dynamic Motion Primitives on the commercial mobile platform 'REEM'. A particular focus of this project is to compare the respective advantages of motion primitives and sampling-based motion planning approaches in the context of human-robot interaction. Pal Robotics is supporting Freek Stulp by co-financing travel costs for regular project meetings in Barcelona: <http://www.pal-robotics.com/blog/freek-stulp-visited-pal-robotics/>. In 2012 this collaboration has lead to a paper at Humanoids [45], and a video at IROS, which was selected for an interactive session, "in consideration of the quality of your work".

IMARA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

In 2012, a new bilateral collaboration between Valeo and IMARA started involving the development of advanced driving assistance systems. The first topic was in the development of an advanced docking system using vision based perception and automatic control of the vehicle. The second topic has just started around driver monitoring using vision. Two bilateral contracts were signed as well as an associated NDA between both institutions.

LAGADIC Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. Dassault Aviation

Participants: Laurent Coutard, François Chaumette.

no. Inria Rennes 5140, duration : 36 months.

This contract that started in 2009 supported Laurent Coutard's Ph.D. about automatic aircraft landing on carrier by visual servoing (see Section 6.2.6).

7.1.2. Fondation EADS

Participants: Antoine Petit, Eric Marchand.

no. Inria Rennes 5605, duration : 36 months.

This contract that started in March 2011 supports Antoine Petit's Ph.D. about 3D model-based tracking for applications in space (see Section 6.1.1).

7.1.3. Orange Labs

Participants: Pierre Martin, Eric Marchand.

no. URI 10CC310-03, duration : 36 months.

This contract started in February 2010. It is devoted to support the Cifre convention between Orange Labs and Université de Rennes 1 regarding Pierre Martin's Ph.D (see Section 6.3.3).

7.1.4. 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.

7.1.5. ECA Robotics

Participants: Romain Drouilly, Patrick Rives.

no. Inria Sophia 7030, duration : 36 months.

This project that started in May 2012 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.

AYIN Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts and Grants with Industry

7.1.1. Galderma Sophia-Antipolis

Participants: Sylvain Prigent, Xavier Descombes [Morpheme PI], Josiane Zerubia [AYIN PI].

Contribution of multi and hyperspectral imaging to skin pigmentation evaluation. Contract #4383.

7.1.2. ISA/DITEN

Participants: Aurélie Voisin, Vladimir Krylov, Josiane Zerubia [AYIN PI].

Development and validation of multitemporal image analysis methodologies for multirisk monitoring of critical structures and infrastructures. In collaboration with Gabriele Moser and Sebastiano Serpico [PI], from the University of Genoa (DITEN) and the Italian Space Agency (ISA).

7.1.3. EADS foundation

Participants: Ikhlef Bechar, Josiane Zerubia [PI].

Detection of objects in infrared imagery using phase field higher-order active contours. In collaboration with Ian Jermyn from the University of Durham (Dept of Mathematical Sciences).

7.1.4. Astrium/EADS

Participants: Paula Craciun, Josiane Zerubia [PI].

Automatic object tracking on a sequence of images taken from a geostationary satellite. In collaboration with Pierre Del Moral from Inria Bordeaux (ALEA team) and Ecole Polytechnique (CMAPX) Palaiseau.

IMEDIA2 Team (section vide)

LEAR Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Start-up Milpix

Participants: Hervé Jégou [Inria Rennes], Cordelia Schmid.

In 2007, the start-up company MILPIX has been created by a former PhD student of the LEAR team, Christopher Bourez. The start-up exploits the technology developed by the LEAR team. Its focus is on large-scale indexing of images for industrial applications. Two software libraries were licensed to the start-up: BIGIMBAZ and OBSIDIAN.

7.2. MBDA Aerospatiale

Participants: Albert Gordo, Michael Guerzhoy, Frédéric Jurie [University of Caen], Cordelia Schmid.

The collaboration with the Aerospatiale section of MBDA has been on-going for several years: MBDA has funded the PhD of Yves Dufurnaud (1999-2001), a study summarizing the state-of-the-art on recognition (2004), a one year transfer contract on matching and tracking (11/2005-11/2006) as well as the PhD of Hedi Harzallah (2007-2010). In September 2010 started a new three-year contract on object localization and pose estimation.

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

Participants: Anoop Cherian, Adrien Gaidon, Zaid Harchaoui, Yang Hua, Cordelia Schmid.

This collaborative project, starting 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. Adrien Gaidon was funded by this project.

7.4. Xerox Research Center Europe

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

In a collaborative project with Xerox, starting October 2009, we work on cross-modal information retrieval. The challenge is to perform information retrieval and document classification in databases that contain documents in different modalities, such as texts, images, or videos, and documents that contain a combination of these. The PhD student Thomas Mensink was supported by a CIFRE grant obtained from the ANRT for the period 10/09 – 09/12. A second three-year collaborative project on large scale visual recognition started in 2011. The PhD student Zeynep Akata is supported by a CIFRE grant obtained from the ANRT for the period 01/11 – 01/14.

7.5. Technosens

Participants: Guillaume Fortier, Cordelia Schmid, Jakob Verbeek.

In October 2010 we started an 18 month collaboration with Technosens (a start-up based in Grenoble) in applying robust face recognition for application in personalized user interfaces. During 18 months an engineer financed by Inria’s technology transfer program, implemented and evaluated our face recognition system on Technosens hardware. Additional development aimed at dealing with hard real-world conditions.

MAGRIT Project-Team (section vide)

MORPHEO Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts with Technicolor

A three year collaboration with Technicolor has started in 2011. The objective of this collaboration is to consider the capture and the interpretation of complex dynamic scenes in uncontrolled environments. A co-supervised PhD (Abdelaziz Djelouah) has started on this topic [6].

PERCEPTION Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contract with Samsung Electronics

We continued a collaboration with the Samsung Advanced Institute of Technology (SAIT), Seoul, South Korea. Within this project we develop a methodology able to combine data from several types of visual sensors (2D high-definition color cameras and 3D range cameras) in order to reconstruct, in real-time, an indoor scene without any constraints in terms of background, illumination conditions, etc. A software package was successfully installed in December 2012 at Samsung.

PRIMA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. CAPEE - plateforme Capteur d'Activité et de Présence pour l'Efficacité Énergétique

Participants: James Crowley [correspondant], Lucas Nacsas, Amaury Nègre, Lukas Rummelhard.

In Cooperation with local PME Novazion, Inria has worked with and Schneider Electric to create a research platform for activity recognition for Smart Energy Systems. This system integrates information from multiple environmental sensors to detect and track people in indoor environments. Copies of this system have been installed at Schneider Electric Homes research group in Grenoble and in the Smart Spaces lab at Inria Montbonnot.

An associated software, named MultiSensor activity tracker, integrates information from multiple environmental sensors to keep track of the location and activity of people in a smart environment. This model is designed to be used by a home energy broker that would work in conjunction with a smart grid to manage the energy consumption of home appliances, balancing the needs of inhabitants with opportunities for savings offered by electricity rates. This database will also be used for by advisor services that will offer advice to inhabitants on the consequences to energy consumption and energy cost that could potentially result from changes to lifestyle or home energy use.

SIROCCO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. 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.
- 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 of very high resolution and characterized by low motion. The first year has been dedicated to the study of different methods for learning tree-structured dictionaries, which can be 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. The performance of the dictionaries both in terms of PSNR versus sparsity and versus actual bit rate has been assessed.

7.1.2. *Collaboration with Alcatel on robust video compression*

Participants: Marco Bevilacqua, Christine Guillemot, Ronan Le Boulch, Aline Roumy.

- Title: Self adaptive video codec
- Funding: Joint research laboratory between Inria and Alcatel
- Period: Oct. 2010 - Dec. 2013.

In the framework of the joint research lab between Alcatel-Lucent and Inria, we participate in the ADR (action de recherche) Selfnets (or Self optimizing wireless networks). The objective is, jointly with the Alcatel Lucent team, to develop video representations and compression tools allowing smooth network adaptation on one hand and loss resilience on the other hand. In that context, the PhD thesis of M. Bevilacqua focuses on the development and study of image and video super-resolution as a tool for constructing scalable representations, hence enabling network adaptation of transmitted video streams. Despite the use of scalable representations and of error correcting codes, the reconstructed video after decoding may still suffer from residual losses. The effect of these residual losses can be mitigated using loss concealment techniques, as developed within the ANR-ARSSO project. However, loss concealment does not allow perfect recovery of the lost data. The reconstructed video after loss concealment is hence still corrupted by noise. Forward error correction using wyner-ziv encoded video is therefore also envisaged as an additional protection means, to cope with the residual noise after loss concealment.

7.1.3. *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-Feb.13.

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.

7.1.4. Contract with SHOM (Service Hydrographique et Océanographique de la Marine)

Participants: Alan Bourasseau, Olivier Le Meur.

- Title: Oceanographic data compression
- Partners: SHOM, Alyotech, Univ. Rennes 1
- Funding: SHOM
- Period: 09/2012-02/2013.

The project consists in developing lossless and lossy compression algorithms for oceanographic data in partnership with ALYOTECH. The SIROCCO team contributes on the design and development of compression algorithms for this specific type of data, based on diffusion methods. The main constraint is the limited bandwidth used by the navy to transmit the data, i.e. an emitted message must be smaller than 4 kilo bytes. The obtained quality versus rate performances will be assessed against those given by state of the art solutions (HEVC-Intra and JPEG-2000).

7.2. Grants with Industry

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

Participants: Christine Guillemot, Bihong Huang.

- Title : Generalized lifting for video compression.
- Research axis : § 6.3.4 .
- Partners : Orange Labs, Inria-Rennes.
- Funding : Orange Labs.
- Period : Apr.12-Mar.15.

This contract with Orange labs. (starting in April. 2012) concerns the PhD of Bihong Huang and aims at investigating various forms of generalized lifting as efficient lossless and lossy coding operators in a video encoder. 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 (Ph. Salembier) in Barcelona.

7.2.2. CIFRE contract with Orange on 3D quality assessment

Participants: Darya Khaustova, Olivier Le Meur.

- Title : Objective Evaluation of 3D Video Quality.
- Research axis : § 6.1.1 .
- Partners : Orange Labs, Inria-Rennes.
- Funding : Orange Labs.
- Period : Dec.11-Nov.14.

This contract with Orange labs. (starting in Dec. 2011) concerns the PhD of Darya Khaustova and aims at developing 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 accurately 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.

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

Participants: Martin Alain, Safa Cherigui, Christine Guillemot.

- Title : Spatio-temporal analysis and characterization of video scenes
- Research axis : § 6.1.3 .
- Partners : Technicolor, Irista/Inria-Rennes.
- Funding : Technicolor, ANRT.
- Period : Ph.D Of S. Cherigui (Nov.09- Oct.12); Ph.D. of M. Alain (Oct.12-Sept.15).

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 methods and models based on sparse and data dimensionality reduction techniques, as well as on concepts of epitomes. The objective was then to use these models and methods in different image processing problems focusing in particular on video compression. Among the main achievements, one can first cite novel Intra prediction techniques using data dimensionality reduction methods with correspondance map-aided K-NN search. A novel method has also been introduced for constructing epitome representations of an image, with rate-distortion optimization criteria. The epitome coupled with inpainting is used for image compression, showing significant performance gains with respect to H.264 Intra prediction modes. The above results have led to a best student paper award at IEEE-ICASSP 2012 [21], one nominated paper among the 11 finalists for a best student paper award at IEEE-ICIP 2012 [22], one journal publication in the IEEE Trans. on Image Processing [13] and to 6 patents.

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 hence just started 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 video inpainting.

7.2.4. 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 preanalysis approaches.
- Partners : Thomson Video Networks, Univ. Rennes 1.
- Funding : Thomson Video Networks (TVN).
- Period : Nov.12-Sept.15.

This contract with TVN (starting 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. A pre-analysis or a first coding pass. This latter would provide useful estimates such as rate distortion characteristics of video, the set of quantization parameters (often called just QPs). These estimated characteristics would help to select quantization parameters for the second pass in order to reduce the computational complexity by keeping a good quality.

STARS Team (section vide)

TEXMEX Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Consulting agreement with the LTU company

Participant: Hervé Jégou.

Following the interaction in the context of the Quaero Project, LTU and Inria have signed a consulting agreement. In this context, Hervé Jégou has provided some expertise to the company in March 2012.

7.2. Bilateral Grants with Industry

7.2.1. Contract with Orange Labs

Participants: Pascale Sébillot, Khaoula Elagouni.

Duration: 36 months, since October 2009.

K. Elagouni's Ph.D. thesis is supported by a CIFRE grant in the framework of a contract between Orange Labs and TEXMEX. The aim of the work is to investigate a more semantic approach to describe multimedia documents based on textual material found inside the images.

7.2.2. Contract with INA (*Institut national de l'audiovisuel*)

Participants: Guillaume Gravier, Ludivine Kuznik, Pascale Sébillot.

Duration: 36 months, since April 2011.

Ludivine Kuznik's Ph.D. thesis is supported by a CIFRE grant in the framework of a contract between INA and TEXMEX within the OSEO/QUAERO project. The aim of the work is to investigate a more semantic approach to structure and navigate very large collections of TV archives.

7.2.3. Contract with Orange Labs

Participants: Patrick Gros, Mohamed-Haykel Boukadida.

Duration: 36 months, since January 2012.

M.H. Boukadida's Ph.D. thesis is supported by a CIFRE grant in the framework of a contract between Orange Labs and TEXMEX. The aim of the work is to investigate the use of constraint programming to define a general framework for video summarization and repurposing.

7.2.4. Contract with INA

Participants: Guillaume Gravier, Bingjing Qu.

Duration: 36 months, since May 2012.

Bingjing Qu's Ph.D. thesis is supported by a CIFRE grant in the framework of a contract between INA and TEXMEX. The aim of the work is to infer the structure of collections of homogeneous documents.

7.2.5. Contract with Technicolor

Participants: Cédric Penet, Guillaume Gravier, Patrick Gros.

Duration: 36 months, since October 2010.

C. Penet's Ph.D. thesis is supported by a CIFRE grant in the framework of a contract between Technicolor and TEXMEX. The aim of the work is to develop methods to detect audio events and to apply these techniques to violence detection in films.

WILLOW Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. EADS (ENS)

Participants: Jean Ponce, Josef Sivic, Andrew Zisserman.

The WILLOW team has had collaboration efforts with EADS via tutorial presentations and discussions with A. Zisserman, J. Sivic and J. Ponce at EADS and ENS, and submitting joint grant proposals. In addition, Marc Sturzel (EADS) is doing a PhD at ENS with Jean Ponce and Andrew Zisserman.

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

Participants: Jean Ponce, Josef Sivic, Ivan Laptev.

This collaborative project, already mentioned several times in this report, 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.

7.3. Google: Learning to annotate videos from movie scripts

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.