RESEARCH CENTER

FIELD
Perception, Cognition and Interaction

Activity Report 2015

Section Highlights of the Team

Edition: 2016-03-21

VISION, PERCEPTION AND MULTIMEDIA INTERPRETATION

DAHU Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

Best student paper award for Nadime Francis [22] at the conference ICDT'15.

Luc Segoufin and Victor Vianu obtained the ACM Alberto O. Mendelzon PODS Test of Time Award in 2015.

DREAM Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

The Dream project ended on the 31st of december 2015. A new EPI project, named Lacodam, is under way.

EXMO Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Our work on alignment revision (§7.3.2) has been published in *Artificial intelligence* [7].

GRAPHIK Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Michel Chein was nominated at the **Academy of Science and Literature from Montpellier** (Académie des Sciences et des Lettres de Montpellier). It is the first nomination of a computer scientist in this academy.

  http://www.inria.fr/centre/sophia/actualites/michel-chein-elu-membre-de-l-academie-des-sciences-et-lettres-de-montpellier

- By joining the team, Meghyn Bienvenu (CR researcher) brings her deep expertise in description logics and complexity, in particular applied to ontology-based data access, a core focus in GraphIK. She was recently put forward by the national committee of the CNRS ("section 6 du comitée national", http://cn6.fr/) to receive the bronze medal of the CNRS.

LINKS Team

5. Highlights of the Year

5.1. Highlights of the Year

SheX

SHEX SCHEMAS FOR RDF GRAPHS IN COOPERATION WITH THE W3C

I. Boneva and S. Staworko present the RDF schema language SheX [22] in cooperation with members of the W3C. The usual open world approach of RDF is schemaless in the alphabets of RDF data are left open, so that data from different sources and with different alphabets can be unified. This raises serious problems for query writing and thus linked data integration, since the same query may become invalid when the alphabet changes. A SheX schema allows express constraints on the alphabets, node labels and edge labels of RDF graphs, so that databases queries become safe with respect to future changes, without that the alphabets need to be closed. This work is highly relevant for the future on data integration for RDF data based on schema mappings.

IJCAI

REASONABLE HIGHLY EXPRESSIVE QUERY LANGUAGES

In his IJCAI paper [17] P. Bourhis develops a highly expressive Web query language of the Datalog family, for which static analysis problems such as query containment remain decidable. The relevance of this result is explained to non-experts in a popularization article: http://www.cnrs.fr/ins2i/spip.php?article1465

5.1.1. Awards

This paper obtained the honorable mention of IJCAI .

IJCAI-highlight

LEARNING JOIN QUERIES FROM EXAMPLES

Ciucanu, A. Boneva, and S. Staworko published an article at ACM TODS [7], where they show how to learn join queries for relational databases from examples. The learning algorithm they provide is shown to satisfy Gold's learning model. Previously this model got applied only to inference of automata rather than logical queries. Furthermore, this is the first query learning algorithm that relies on equalities of data values rather than on the structure of metadata.

BEST PAPERS AWARDS :

[17] **IJCAI**. P. BOURHIS, M. KRÖTZSCH, S. RUDOLPH.

MAGNET Team

5. Highlights of the Year

5.1. Highlights of the Year

We have published two papers at NIPS [3], [6], the leading conference in machine learning. The first paper presents novel results on large-scale learning with higher-order risk functionals, which has applications in link prediction, graph inference and metric learning (among others). The second paper proposes new gossip algorithms for decentralized estimation of pairwise statistics in networks.

We have published a paper at AAAI [4], one of the top conferences in Artificial Intelligence. The contribution is a new structured model for learning anaphoricity detection and coreference resolution, which achieved the best score to date on the popular CoNLL benchmark with gold mentions.

We have published a paper at EMNLP [2], a leading conference in Natural Language Processing. The work presents a detailed comparative framework for assessing the usefulness of popular unsupervised word representations for identifying so-called implicit discourse relations.

OAK Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

I. Manolescu and X. Tannier (LIMSI) have obtained a Google Computational Research Journalism Award on "Event Thread Extraction for Viewpoint Analysis". The team has also secured an ANR contract on content management techniques applied to computational fact-checking (coordonated by I. Manolescu, to start in 2016) and an ADT engineer has joined the team to work on the same topic.

The best publications of the year appeared in SIGMOD citecamachorodriguez:hal-01178490, PODS [16], PVLDB [29], [8], [26], ICDE [15], [14], and IEEE TKDE [3]. Other highly visible publications appeared in CIDR [9] and CIKM [28], [7].

5.1.2. Inria researcher recruited

M. Thomazo has joined the team as a junior researcher (Inria CR2).

ORPAILLEUR Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Aleksey Buzmakov was nominated at the 13th International Conference on Formal Concept Analysis (ICFCA, Nerja Málaga, Spain, June 23-26 2015) as the "best promising researcher in Formal Concept Analysis" and won the best student paper award [53].
- Two (very) young researchers have made a stay in the team, Artuur Leeuwenberg in Spring 2014 and Alibek Sailanbayev in Spring 2015. Both young researchers have done a very good work which was rewarded by two conference publications, [66] and [46]. The Orpailleur team is particularly proud of the very good results of these young researchers.
- Three PhD students, namely Alam Mehwish, Aleksey Buzmakov and Victor Codocedo, have joined their efforts in their last year of thesis preparation for working on a common topic, the completion of web of data. This very good and very uncommon research work was rewarded by a publication in the very highly selective IJCAI 2015 Conference [1].
- The paper "Miguel Couceiro, Lucien Haddad, Karsten Schölzel, Tamas Waldhauser. Relation graphs and partial clones on a 2-element set. 44th IEEE International Symposium on Multiple-Valued Logic (ISMVL 2014), IEEE Computer Society, 161-166." was awarded the "Outstanding Contributed Paper Award" at the conference ISMVL 2015 (IEEE Computer Society).
- The Taaable system won 3 of the 5 prizes of the 8th "Computer Cooking Contest", which was held during the International Conference on Case-Based Reasoning, in Bad Homburg, Germany (http://ccc2015.loria.fr/?id=rules): the prize of the best cocktail system according to the jury, based on the technical/scientific paper reviews and on the comparison of the results of the systems on a same set of queries, the prizes of the public for the cocktail and sandwich systems, based on the vote after tasting.

5.1.1. Awards

BEST PAPERS AWARDS :
[53] **International Conference in Formal Concept Analysis - ICFCA 2015**. A. BUZMAKOV, S. O. KUZNETSOV, A. NAPOLI.

SMIS Project-Team (section vide)

TYREX Project-Team (section vide)

WIMMICS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Elena Cabrio successfully obtained an assistant professor position in Wimmics.
- Serena Villata successfully obtained a researcher position (CR1 CNRS) in Wimmics.
- Olivier Corby and Catherine Faron-Zucker received a medal from University Côte d'Azur on December 10th as a follow-up of their IC 2015 best paper award.
- HDR Defense of Freddy Lécué (Inria-IBM)
- Two successful MOOCs (HTML5, Semantic Web)
- Fabien Gandon was General Chair of ESWC 2015 and will be general co-chair of WWW 2018

5.1.1. Awards

BEST PAPERS AWARDS :

[39] **Journées francophones d'Ingénierie des Connaissances**. O. CORBY, C. FARON-ZUCKER.

ZENITH Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

The Pl@ntNet application, co-developed by Zenith, exceeded 1M downloads in October 2015.

ALICE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Geometry Processing: New Algorithms / New Software

This year we developed a set of geometric algorithms to robustly manipulate 3D data and generate volumetric meshes from them, with a special focus on usability, efficiency and robustness. The pipeline that we developed includes a simple and scalable surface reconstruction algorithms, a compiler for generating C++ code for robust geometric predicates, an efficient implementation of 3D Delaunay triangulation, the first algorithm to compute optimal transport in 3D, and an algorithm to generate hexahedral-dominant meshes.

As a result of the VORPALINE ERC Proof of Concept project, we distribute most of these algorithms in our open-source low-level Geogram library and Graphite graphics user interface. Some algorithms are distributed in the commercial VORPALINE software (hex-dominant meshing), proposed to the sponsors of the GOCAD consortium. The Proof of Concept project made it possible to set up tools for software quality (continuous integration, non-regression testing, systematic Doxygen documentation of all classes/functions/parameters).

Fabrication

This year has seen some important advances regarding the objectives of the ERC ShapeForge, with the publications of two novel techniques for the synthesis of structures from examples [9], [12]. We have proposed to formulate a shape synthesis problem as an appearance synthesis problem under minimal rigidity constraints. This affords for the automatic synthesis of structurally sound objects under specific boundary conditions (attachments and loads), while producing objects that visually resemble an example pattern.

We have continued to include the results of our research into our additive manufacturing software IceSL, which has been augmented with a new user interface to make it more accessible.

This year we also gave a half-day course at ACM SIGGRAPH on fused filament deposition software in collaboration with Makerbot, one of the major manufacturer of consumer level 3D printers. The course is available online at http://webloria.loria.fr/~slefebvr/sig15fdm/.

AVIZ Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

We had a number of highlights this year:

- Aviz researchers contributed 29 publications this year. Amongst these seven papers were presented at IEEE VIS, the largest international Visualizations and Visual Analytics conference. Four full papers were presented at CHI, the largest international conference on human computer interaction;
- Aviz researchers organized two workshops and one tutorial at international conferences (ACM ITS, and IEEE VIS);
- Eight awards were won by Aviz researchers for papers, service contributions, and PhD theses (see below);
- We welcomed three international researchers and students to our lab for research visits;
- Aviz researchers taught four lectures at various French and international universities.

Awards

- Samuel Huron won the best thesis award at the IEEE VGTC Vis Pioneer Group Best PhD Dissertation Award for his thesis "Constructive Visualization: A Token-based Paradigm Allowing to Assemble Dynamic Visual Representation for Non-experts" []
- Jeremy Boy got an honorable mention award at the IEEE VGTC Vis Pioneer Group Best PhD Dissertation Award for his thesis "Engaging the People to Look Beyond the Surface of Online Information Visualizations" [10]
- Jean-Daniel Fekete received an IEEE TVCG service award for organizing VIS'14 in Paris
- Petra Isenberg and Tobias Isenberg received a IEEE Computer Society Certificate of Appreciation for co-chairing the http://beliv-2014.cs.univie.ac.at/index.php2014 BELIV Workshop on "Beyond Time And Errors: Novel Evaluation Methods For Visualization"
- Wesley Willet, Tobias Isenberg, and Pierre Dragicevic received a best paper award from the ACM Conference on Human Factors in Computing Systems (CHI) for their paper "Lightweight Relief Shearing for Enhanced Terrain Perception on Interactive Maps" [33].
- Charles Perin, Jeremy Boy and Frédéric Vernier received an honorable Mention (2nd prize) for "Le Tour de France at a Glance" visualiation in the IEEE VGTC/VPG International Data Visualization Contest.
- Jeremy Boy won the World Statistics Day 2015 Data Visualization Contest with his "Is the World a Better Place Today" online visualization platform.

BEST PAPERS AWARDS :

[] **Constructive Visualization**.

[33] **Proceedings of the Conference on Human Factors in Computing Systems (CHI)**. W. WILLETT, B. JENNY, T. ISENBERG, P. DRAGICEVIC.

EX-SITU Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

Michel Beaudouin-Lafon received the ACM SIGCHI Lifetime Service Award, which "goes to individuals who have contributed to the growth and success of SIGCHI in a variety of capacities. This award is for extended services to the community at large over a number of years" (http://www.sigchi.org/about/awards/2015-sigchi-awards).

Jérémie Garcia received the "Prix Jeune Chercheur Science et Musique", a best thesis award organized by IRISA (Rennes) and sponsored by the Association Française d'Informatique Musicale for his thesis *""Le papier interactif pour la composition musicale"*, supervised by Wendy Mackay, Theophannis Tsandilas and Carlos Agon (IRCAM) (http://jsm.irisa.fr/index.php/prix-jc.

Nolwenn Maudet received the "Prix Spécial du Jury du premier concours EDUCNUM Opération Vie privée", organized by CNIL (national commission for informatics and freedom), for her project *Data Fiction* with Thomas Thibault. This online game is designed to help teenagers better understand how their personal data can be exposed online and how to protect it.

ExSitu received three paper awards. One paper, *Webstrates* [18] received a best paper award at UIST 2015. Two other papers, *Color Portraits* [17] and *SketchSliders* [20], received Honorable Mention awards at CHI 2015 (at most 5% of CHI submissions receive an Honorable Mention).
BEST PAPERS AWARDS :
[18] **28th Annual ACM Symposium on User Interface Software and Technology (UIST'15)**. C. KLOKMOSE, J. EAGAN, S. BAADER, W. MACKAY, M. BEAUDOUIN-LAFON.

GRAPHDECO Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

This was the first year of existence of GRAPHDECO, which was officially created in July 2015. The group has advanced on its main research axes, that of Computer-Assisted Design with Heterogeneous Representations and Graphics with Uncertainty and Heterogeneous Content. Our most notable results are our ACM Transactions on Graphics papers on regularized curvature fields [7], multi-view intrinsic images and relighting [6] and finally computer-assisted crafting on wire-wrapping [8]. The ANR DRAO was completed in December with an excellent review result, and the EU project CR-PLAY was also evaluated with excellent results for it's 2nd year. Two Ph.D. students graduated this year (S. Duchêne [2] and E. Iarussi [3]) and A. Bousseau defended his Habilitation [1].

5.1.1. Awards

Kenneth Vanhoey received a thesis award from the University of Strasbourg, from which he graduated in 2014. Johanna Delanoy and Adrien Bousseau won second best paper award in the AFIG [5].

HYBRID Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Hybrid had 4 papers published at IEEE Virtual Reality Conference in 2015 : [19] [16] [18] [23].

Hybrid team was also strongly involved in IEEE Virtual Reality Conference, which took place for the first time in France in 2015 (Arles, March 23-27), with A. Lécuyer: Program Chair, F. Argelaguet and M. Marchal: Research Demos Chairs, F. Nouviale: Exhibit Chair, B. Arnaldi: Supporters Chair.

5.1.1. Awards

- Best PhD Thesis award from “Fondation Rennes 1” for former PhD student Fabien Danieau for his work "Contribution to the study of haptic feedback for improving the audiovisual experience" co-supervised with Technicolor company.
- Project PREVIZ received the “business” award in Trophies “Loading the future” (24/11, Nantes, Competitivity Cluster "Images et Réseaux").
- The algorithm developed by Lucas Royer (co-supervised by A. Krupa, M. Marchal and G. Dardenne) won the first place of the MICCAI Challenge on Liver Ultrasound Tracking.

ILDA Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- ACM CHI Honorable mention for **An Evaluation of Interactive Map Comparison Techniques** [4], awarded to the top 5% of all 2150 paper submissions.
- ACM CHI Honorable mention for **SketchSliders: Sketching Widgets for Visual Exploration on Wall Displays** [9], awarded to the top 5% of all 2150 paper submissions.

IMAGINE Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

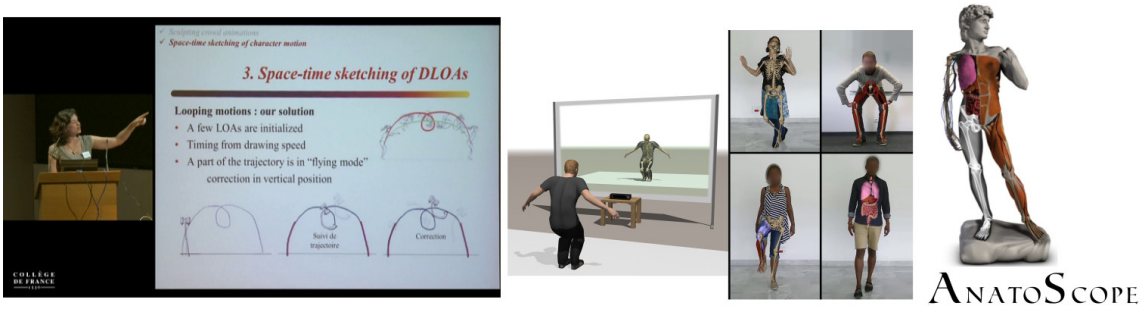

Figure 1. Left: Symposium organised by Marie-Paule Cani at Collège de France. Middle Demo of the Living Book of Anatomy presented in the Emergin Technologies at ACM SIGGRAPH Asia. Right: Creation of the startup Anatoscope by Francois Faure and Olivier Palombi.

- Marie-Paule Cani obtained the annual Chair of Informatics and Computational Sciences of the Collège de France in Paris. She organized a series of lectures about *Shaping Imaginary Content: from 3D Digital Design to Animated Virtual Worlds* and a symposium with 7 international invited speakers.
- Remi Ronfard organized the EG Workshop on Intelligent Cinematography and Editing which was for the first time an Eurographics Workshops.
- A demo of the Living Book of Anatomy (PhD work of Armelle Bauer) was presented in the Emerging Technologies exhibition at ACM SIGGRAPH Asia in November.
- François Faure and Olivier Palombi are creating a new startup Anatoscope since November 2015 on *Digital Anatomy for Personalized Healthcare*.
- We had 4 paper accepted to ACM SIGGRAPH [6], [8], [9], [15], and 2 accepted to ACM Transaction on Graphics (TOG) [10], [14], one has been presented at ACM SIGGRAPH Asia.

MANAO Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Our search of a better understanding of appearance have reached some great milestones this year. First, our studies have shown that Bidirectional Reflection Distribution Functions (BRDFs) exhibits some meaningful statistics [21]. They help designing intuitively MatCaps (a shorthand for "Material Capture") that are often used by artists as a simple and efficient way to design appearance [23]. Our studies have also shown that current BRDF models are limited [17]. We are exploring new models and parameterizations [20], [24]. It is worth noting that we are integrating all these researches into a common library named ALTA (http://alta.gforge.inria.fr/).

5.1.1. Awards

"Notable article in computing in 2014", from ACM ThinkLoud Computing Reviews http://www.computingreviews.com/recommend/bestof/notableitems.cfm?bestYear=2014 for our article on The Revealing Flashlight [7].

MAVERICK Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

Three software platforms based on our research were released as open-source distributions in 2015. These platforms contain the result of several years of research, and have been supported by Inria through engineering support:

- Gratin, a node-based compositing software for creating, manipulating and animating 2D and 3D data. It uses an internal direct acyclic multi-graph and provides an intuitive user interface that allows to quickly design complex prototypes.
- Proland, a platform for real-time quality rendering and editing of large landscapes. All features can work with planet-sized terrains, for all viewpoints from ground to space.
- Gigavoxel, a software platform for real-time quality rendering of very large and very detailed scenes which couldn't fit memory. Performances permit showing details over deep zooms and walk through very crowded scenes (which are rigid, for the moment).

MIMETIC Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

In March 2015, Ludovic Hoyet arrived in MimeTIC has full-time Inria CR2 researcher. It's an important event for the team as it will reinforce and push the Virtual Human simulation topic in the team. Ludovic has a unique expertise in both computer animation and perceptual studies which will enable us to tackle original problems, such as developping innovative animation methods while taking the perception of the user into account, contrary to classical approaches based on dynamic simulation.

Our work "Intuitive and Efficient Camera Control with the Toric Space", co-authored by Christophe Lino and Marc Christie has been selected at SIGGRAPH 2015, the premier and most selective computer graphics scientific event. The paper presents a novel representation to interactively and intuitively manipulate cameras, and to perform interpolations between camera keyframes while maintaining on-screen visual properties. Results of this paper, together with earlier work on automated viewpoint computation (Directors Lens patent), are now available as a plugin in Autodesk's Motion Builder. This technology is exploited by the french SME Solidanim http://www.solidanim.com through a technological transfer partnership.

Platforms in Immerstar project: Immerstar is the new name of our jointed platforms, namely Immersia on Inria campus and Immermove on ENS Campus. This year, we succeeded to end up the building of the first phase of Immermove platform. Associated with a sport area equipped with a high end motion capture system, an immersive setup has been installed. It is a L-shaped setup with 12m*4m front screen and floor. It allows to perform immersive interaction experiments between real and virtual human. To follow this first phase, and sustained by Inria and our academic institutions, we succeeded to the CPER call that will be implemented from 2016 to 2020. We will have the opportunity to invest and to improve the two immersive platforms (Immersia and Immermove) and their possibilities of distantly collaborate.

5.1.1. Awards

Caroline Martin won the "Jean Vives" Award for her work on the analysis of tennis serves. This price is discerned by the Académie nationale olympique française and given during the 40th congress of the Society of Biomechanics, 2015.

MINT Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. Art/Science collaborations

4.1.1.1. Art paper and art show at SIGGRAPH ASIA (Kobe): Tools for digital anamorphoses: using raycasting techniques for creation anamorphoses

Anamorphoses have been know for centuries, as distorted images needing to be seen in a mirror from a special point of view in order to see the non-distorted image. During Renaissance, they have been associated to mathematical techniques for drawing such pictures efficiently, on specific mirror shapes (in the case of cylindrical or conical mirrors). We can expect in the next years a strong interest in such type of images, because of the emergence of various contexts and physical supports for image visualisation (soft or de-formable screens, lightmapping, projection of images on dynamic objects, etc...). Solving the numerical problem of anamorphosis in the general case belongs to the same class of problems as when the trend is to control image deformation as long as image is seen projected on, or reflected by, a non-planar surface, which can be of arbitrary shape. In this work, we show how raycasting technique, well-known in the computer graphics community , can be used to provide an efficient general framework for such rendering. We describe an effective procedure for building general anamorphoses. A generalisation of the method leads to the conception of three-dimensional anamorphic sculptures, usable for 3D printing anamorphic objects. We exhibit , through several artworks, tangible and virtual examples.
http://hal.univ-lille3.fr/hal-01258727v1

4.1.1.2. Presented at VISAP (IEEE InfoViz artTrack): "A main levée" Art Installation

Developed in collaboration with MINT, the "A main levée" art installation by Pauline de Chalendar was presented at VISAP, IEEE Infoviz ArtTrack, in August 2016. This immersive installation allows for free hand drawing using a virtual-reality headset. From this artwork (also presented at Panorama 2015 exposition),

4.1.2. Industrial collaboration: Hap2u

A license agreement has been signed with Hap2u, a new start-up which aims at designing new interaction devices, based on our patent on tactile rendering. Hap2u will industrialise commercial products, based on our patents. The beginning of the commercial activity might start in 2016.

4.1.3. MAuVE project

MAuve is a 4 Meuros project (2016-2020), which subject is ICT-based tools for mediation and access to knowledge. L. Grisoni is leading this project, along with S. Bartholeyns (historian, Lille 3) and S. Chaumier (sociologist, Univ. Artois).

Mjolnir Team

5. Highlights of the Year

5.1. Highlights of the Year

The team has strengthened its ties with leading research groups in Canada:

- Fanny Chevalier has been appointed at the rank of Assistant Professor (status only) by the Department of Computer Science of the University of Toronto.
- Stéphane Huot has been granted the "Collaborator" status by the Centre for Interdisciplinary Research in Music Media and Technology (CIRMMT) of McGill University.
- Mitacs/Inria research awards allowed two of our Phd students to visit the University of Waterloo and McGill University. A third Mitacs award with Campus France will allow one PhD student from Carleton University to visit us in early 2016.
- Two other PhD students and three researchers from McGill University, the University of Waterloo and the University of Toronto visited us over the year.

Fanny Chevalier spent a week with the French news website Rue89 in October and one of their journalists (Benoît Le Corre) later spent one week at Inria Lille. Four articles published on Rue89 resulted from these visits, with over 40,000 views at the time of this writing.

POTIOC Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Fabien Lotte obtained the ANR project REBEL (JCJC, acceptance rate 9.7%). More details in Section 9.2
- We have conceived a new system that aims at teaching Optics in an innovative way (Patent pending). This system mixes spatial augmented reality and tangible interaction. It is currently evaluated based on a panel of more than one hundred students. This work is conducted in collaboration with experts in Optics and Electronics (Univ. Bordeaux), and Education Sciences (Univ. Lorraine). More details in Section 7.6 .

5.1.1. Awards

IFRATH PhD Award, First Prize ex-aequo with J. Veytizou, Institut Fédératif de Recherche sur les Aides Techniques pour personnes Handicapées, June 2015 (Anke Brock)

BEST PAPERS AWARDS :

[39] **Colloque des Jeunes Chercheurs en Sciences Cognitives**. C. JEUNET.

[27] **PhyCS - International Conference on Physiological Computing Systems**. J. FREY.

TITANE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Yuliya Tarabalka has joined our team since January 2015, making our initial objective to implement a synergy between geometry and image/vision more concrete.

On robust reconstruction of complex shapes and scenes we obtained a wide range of new results. One noticeable result is an approach for reconstruction of indoor scenes, which received the U. V. Helava Award Best Paper 2014. In our quest for semantized reconstruction we contributed an approach for reconstruction of levels of details of urban scenes, in accordance to the CityGML format. This work has been published in ACM Transactions on Graphics, and presented at ACM SIGGRAPH 2015. We also contributed a robust 3D reconstruction approach for underwater scenes, the latter exhibiting many new challenges in terms of data defect such as uncertainty and unprecedented level of outliers. Finally, we contributed a STAR (state of the art) report at the EUROGRAPHICS conference on 3D reconstruction from point clouds, which is being converted into a survey for the Computer Graphics Forum journal.

Our two-year efforts on the problem of isotopic shape approximation have turned into a new publication at the premier venue in Computer Graphics: the ACM SIGGRAPH conference 2015, and a patent. We derived a novel algorithm that generates a surface triangle mesh, given an input tolerance volume guaranteed to be within the tolerance, intersection free and topologically correct. Despite being a long standing problem, there was still no robust and practical solution to this enduring scientific challenge. This problem is both relevant to, and timely for, the increasing variety of industrial applications that involve raw geometric data.

The scientific impact of our contributions is illustrated by publications in premier journal and conference venues in our field, both in geometry processing and computer vision: ACM Transactions on Graphics and SIGGRAPH, Computer Graphics Forum, EUROGRAPHICS, IEEE Conference on Computer Vision and Pattern Recognition (CVPR), IJCV, IJRS/ISPRS. Note also that our work on underwater reconstruction has been published in the premier journal on robotic research.

Awards

Xavier Rolland-Nevière obtained the best student paper award for “track IFS” of ICASSP (IEEE International Conference on Acoustics, Speech and Signal Processing) .

Sven Oesau, Florent Lafarge and Pierre Alliez received the U.V. Helava Award Best Paper for year 2014: “Indoor Scene Reconstruction using Feature Sensitive Primitive Extraction and Graph-cut”. ISPRS Journal of Photogrammetry and Remote Sensing, 2014.

BEST PAPERS AWARDS :

[16] **IEEE International Conference on Acoustic, Speech Signal Processing (ICASSP)**. R.-N. XAVIER, G. DOËRR, P. ALLIEZ.

ALPAGE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

In 2015, Alpage has obtained three new national fundings: the team is a partner of two new ANR projects (PARSEME-FR and SoSweet) and an industrial contract ("RAPID" project VeRDI).

5.1.1. Awards

Best Paper Award at the TALN 2015 conference .
BEST PAPERS AWARDS :
[22] **TALN 2015**. M. COAVOUX, B. CRABBÉ.

MULTISPEECH Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

We ranked 2nd among 9 teams for the ”Professionally produced music recordings” task of the 2015 Signal Separation Evaluation Campaign (SiSEC) [75].

We ranked 4th among 25 teams and as the best European team for the 3rd CHiME Speech Separation and Recognition Challenge [55].

5.1.1. Awards

Baldwin Dumortier received the best poster prize at EWEA 2015 (European Wind Energy Association 2015 Annual Event) [31].

Best paper award at SIIE 2015 (6th International Conference on Information Systems and Economic Intelligence) [34].
BEST PAPERS AWARDS :
[34] **IEEE International Conference on Information Systems and Economic Intelligence**. D. FOHR, I. ILLINA.

PANAMA Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

Srdan Kitic won the CONEXANT award for best student paper on audio signal processing at LVA/ICA'2015 conference .

BEST PAPERS AWARDS :

[31] **LVA/ICA 2015 - The 12th International Conference on Latent Variable Analysis and Signal Separation**. S. KITIĆ, N. BERTIN, R. GRIBONVAL.

SEMAGRAMME Project-Team (section vide)

Chroma Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Evolution of team

1. Creation of the team : March 2015.
2. Anne Spalanzani, Associate Professor at UPMF, joined the team on December 2015 (previously in Prima team).
3. Leaving of Dizan Vasquez, SRP Inria, for the Apple compagny, on January 2016.

5.1.2. Projects and results

1. Acceptation of the European H2020 Ecsel project "ENABLE" (European Initiative to Enable Validation for Highly Automated Safe and Secure Systems) (November 2015). Chroma is involved in the automated vehicles theme. Fundings for Chroma are 700K€, over 3 years.

DEFROST Team

5. Highlights of the Year

5.1. Highlights of the Year

Inverse deformable model in real-time by quadratic programming optimization

We have published the formulation of an inverse deformable model that we can compute in real time in the form of quadratic problem under equality and inequality constraints. After the projection of the deformable model in the reduced space of unknown parameters, we get an extremely compact formulation of the problem to be optimized. The quadratic formulation allows to write the problem with the conditions Karush-Kuhn-Tucker (KKT) and thus have certainties about the uniqueness and optimality of a solution. This formulation was used in image registration project for adaptive radiotherapy (study published in the International journal of computer assisted radiology and surgery) and also to calculate the inverse model of a deformable robot (study published in the conference ICRA 2015).

Deformable robots with vertebras

We proposed a for generic modeling method suitable for manipulator arm composed of a successive series of deformable portion (inter-vertebrae) and rigid (vertebrae). This method is very computationally efficient and compatible with real-time. These manipulators have a very large number of degrees of freedom. Our approach is to make a domain decomposition from a FEM model on inter-vertebrae and pre-compute a condensation of the model on the vertebrae to drastically reduce the complexity of the model used online. Condensed models are assembled for the global model of the robot. We have demonstrated in an article published in the ICRA 2015 conference that this model allowed to pilot the flexible robot CBHA developed by Festo. Furthermore, we have used this model to propose a new manipulator arm design called FETCH to the competition website Robotic Toolkits Harvard University. We had the 2nd place ex-aequo with 4 other teams.

SOFA

The work we have done and published around our simulation platform SOFA allowed us to get the price "Dirk Bartz Prize for Visual Computing in Medicine 2015," a biennial competition organized by the Eurographics conference. This award recognizes the significant contributions in computer graphics have an impact in the field of medicine. Parallel to that price, a consortium was created to SOFA (https://www.sofa-framework.org/sofa-consortium/) whose objective is to bring the academic community and users of industrial SOFA and also of guide future developments. Defrost is a member of this consortium.

Eurographics Dirk Bartz Prize for Visual Computing in Medicine.

FLOWERS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Scientific Awards

Jonathan Grizou obtained the "Prix Le Monde de la recherche universitaire" for his thesis ([91]) and work on "Learning from unlabeled interaction" [30] [92]. This work allowed in particular to develop new algorithms for Brain-Computer Interfaces that remove the need for a phase of calibration and allow users to achieve sequential tasks. This work was achieved in collaboration with I. Iturrate and L. Montesano (Univ. Zaragoza, Spain), and the PhD was co-supervised by M. Lopes and PY. Oudeyer.

Matthieu Lapeyre obtained the "Second prix de thèse du GDR Robotique" for his thesis on the development of the open-source 3D printed Poppy Humanoid platform [102], now in use in various scientific, educational and artistic projects worldwide http://www.poppy-project.org. This work was achieved in collaboration with P. Rouanet and the PhD was supervised by PY Oudeyer.

Dissemination and transfer

In the context of the Poppy project, a contract was signed between Inria and the company Generation Robots agreeing on the worldwide reselling and distribution of the Poppy robotic kits, and in particular the Poppy Humanoid and Poppy Torso kits: http://www.generationrobots.com/.

The Flowers team made major achievements in diffusing science and technology towards the general public. The team developped the IniRobot pedagogical kit, for the discovery of computer science and robotics in primary schools. The kit was first developped and evaluated in schools, in collaboration with a group of teachers, and then in 2015 saw a large national dissemination, as it has been used by 8000 school children in 35 towns. A dedicated web site has been created, allowing all users and contributors to share their experiences with the kit: https://dm1r.inria.fr/c/kits-pedagogiques/inirobot. Also, in 2015 the team began a large scale transfer project called Poppy Education (Féder/Region Aquitaine/Inria co-finding) targeting to develop, evaluate and disseminate robotic pedagogical kits for teaching ICT in high-schools and university level courses.

HEPHAISTOS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Science

- strong advances on the analysis of cable-driven parallel robots (section 7.1.1)
- collaboration with lawyers on the ethical and legal aspects of robotics
- strong collaboration with the medical community on walking analysis and rehabilitation (section 7.1.2.2)

5.1.2. Experimentation

- start of an extensive test period for our walkers in clinical environment (section 7.1.2.2)
- start of the daily activities monitoring in our building (section 7.1.2.4)
- the workshop *Computer science for artists*

5.1.3. Transfer

- the contract with GénerationRobot for the development of a pedagogical cable-driven parallel robot

5.1.3.1. Awards

- J-P. Merlet has been nominated as IEEE Fellow and doctor honoris causae from University Innsbruck. He was also awarded a prize from Cote d'Azur University
- Y. Papegay was awarded the Wolfram Innovator Award

LAGADIC Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- The work of Lucas Royer and Alexandre Krupa concerning non-rigid target tracking in ultrasound images [47] (see Section 7.6.1) was awarded by the organizers of the MICCAI CLUST'15 challenge (MICCAI Challenge on Liver Ultrasound Tracking) as being the best method for real-time and accurate target tracking in 3D ultrasound sequences.
- Paolo Robuffo Giordano has been awarded as Best Associate Editor of ICRA'2015.

LARSEN Team

5. Highlights of the Year

5.1. Highlights of the Year

Figure 1. Cover the Nature issue of the 28th of May, 2015, which features Larsen's work on trial-and-error learning for damage recovery (ResiBots project).

- Jean-Baptiste Mouret joined the team (CR1, HDR [8], on secondment from Pierre and Marie Curie University for 5 years);
- The ERC project ResiBots (PI: Jean-Baptiste Mouret) started on the 1st of May, 2015;
- The preliminary work on which the ERC project ResiBots is based made it to the cover of Nature (28th of May, 2015), see figure 1 . This work was covered by all the major media outlets and the associated videos total more than 400,000 views on YouTube.

RITS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

Fawzi Nashashibi was awarded by the Higher Council for Innovation & Excellence in Palestine for his innovation research on intelligent transportation. The award was delivered by President Mahmoud ABBAS at the 1st HCIE National Forum for Innovators on innovation, September 12-13 2015, Ramallah, Palestine.
BEST PAPERS AWARDS :
[30] **ITS World Congress 2015**. A. DE LA FORTELLE, X. QIAN.
[35] **2015 IEEE International Conference on Vehicular Electronics and Safety**. R. LUIS, J. PÉREZ RASTELLI, D. GONZALEZ BAUTISTA, V. MILANÉS.

AYIN Team

5. Highlights of the Year

5.1. Highlights of the Year

- Yuliya Tarabalka (Inria junior researcher) and Emmanuel Maggiori (PhD student) moved from AYIN [https://team.inria.fr/ayin/] to TITANE [https://team.inria.fr/titane/] team in January.
- Josiane Zerubia was nominated in November IEEE Signal Processing Society (SPS) Distinguished Lecturer for a duration of 2 years [http://www.signalprocessingsociety.org/newsletter/2015/11/sps-announces-2016-class-of-distinguished-lecturers/].

LEAR Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- Cordelia Schmid received the Humbolt research award, Alexander von Humbolt Foundation, Germany, 2015, and gave the Karen Spärck Jones lecture, annual event of the British Computer Society that honours women in computing research, 2015.
- Cordelia Schmid was ranked among the Thomson Reuters Highly Cited Researcher, 2015.
- Yang Hua, Karteek Alahari and Cordelia Schmid won the VOT-TIR2015 challenge.
- G. Cinbis (PhD, 2014) was awarded the 2014 AFRIF thesis prize for his thesis entitled "Fisher kernel based models for image classification and object localization" at Orasis 2015. He was supervised by Jakob Verbeek and Cordelia Schmid.
- N. Dalal (PhD, 2006) together with his supervisor B. Triggs was awarded the Longuet-Higgins Prize 2015 for his PhD work, in particular the paper entitled "Histograms of Oriented Gradients for Human Detection" (CVPR 2005 paper).

LINKMEDIA Project-Team (section vide)

MAGRIT Project-Team (section vide)

MORPHEO Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- The multi-camera platform Kinovis (http://kinovis.inrialpes.fr) was inaugurated on May 26th 2015. Kinovis is French *Equipement d'excellence* (Equipex project) that provides a unique acquisition platform with 68 color cameras and enables therefore high precision 4D modeling of dynamic scenes.
- The QuickCSG boolean mesh computation software developed within the context of the Kinovis platform was transferred in November of 2015, to a (contractually undisclosed) major industrial actor of the 3D business.

PERCEPTION Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

Robotic Demonstration at ICMI'15. The PERCEPTION team was present at the ACM International Conference on Multimodal Interaction – ICMI'15 (November 2015,Seattle WA, USA) with the demonstration *A Distributed Architecture for Interacting with NAO* [27]. This software package enables robot programming using various languages, e.g. C, C++, Matlab, and Python. This distributed architecture is available under the NAOLab open-source software package. The development of NAOLab is part of PERCEPTION's participation in EU FP7 projects and is funded by STREP project *Embodied Audition for RobotS* (EARS) and ERC Advanced Grant *Vision and Hearing in Action* (VHIA).

The Xerox Foundation University Affairs Committee (UAC) awarded Radu Horaud and Florence Forbes (EPI MISTIS) with a three year grant *Advanced and Scalable Graph Signal Processing Techniques* (2015-2017). Collaboration with Arijit Biswas and Anirban Mondal, research scientists at Xerox Research Center India (XRCI), Bangalore. Information about these awards is available at page 9 of this document available online: http://www.xerox.com/downloads/usa/en/innovation/innovation_xig_brochure.pdf.

MOOC on Binaural Hearing for Robots. In May-June 2015 Radu Horaud taught a five hour MOOC dealing with the fundamental principles of robot hearing, from binaural signal processing to robotic implementations. MOOC content available at https://team.inria.fr/perception/mooc-bhr/ and at https://www.france-universite-numerique-mooc.fr/courses/inria/41004/session01/about.

4.1.1. Awards

- **Vincent Drouard** (PhD student) and his co-authors received the "Best Student Paper Award" (second place) at IEEE ICIP'15 for the paper *Head Pose Estimation via High-Dimensional Regression* . The conference took place in Quebec City, Canada, September 2015. There were five papers awarded, two "Best Paper" and three "Best Student Paper" out of a total of 1033 (oral and poster) papers presented at the conference. IEEE ICIP is the premier international image processing conference series held every year. The work is funded by the ERC Advanced Grant VHIA.
- **Dionyssos Kounades-Bastian** (PhD student) and his co-authors received the "Best Student Paper Award" at IEEE WASPAA'15 for the paper *A Variational EM Algorithm for the Separation of Moving Sound Sources* . The conference took place in New Paltz, NY, USA, October 2015. There were six papers nominated for the award, out of a total of 80 (oral and poster) papers presented at the workshop. The IEEE WASPAA workshop series is among the premier international forums in the field of audio and acoustic signal processing, held every other year. The work is funded by the EU STREP project EARS and the ERC Advanced Grant VHIA.

BEST PAPERS AWARDS :
[28] **IEEE International Conference on Image Processing**. V. DROUARD, S. BA, G. EVANGELIDIS, A. DELEFORGE, R. HORAUD.
[31] **IEEE Workshop on Applications of Signal Processing to Audio and Acoustics**. D. KOUNADES-BASTIAN, L. GIRIN, X. ALAMEDA-PINEDA, S. GANNOT, R. HORAUD.

PRIMA Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. Awards

The paper "The Grenoble System for the Social Touch Challenge at ICMI 2015" by Viet Cuong Ta, Wafa Johal, Maxime Portaz, Eric Castelli, Dominique Vaufreydaz has won the "ICMI 2015 Touch Challenge" at the ICMI 2015 conference".

4.1.2. Events

On 5 June 2015, members of PRIMA have organised the inauguration of the EquipEx platform Amiqual4Home.

SIROCCO Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- C. Guillemot has received a Google faculty research award
- T. Maugey has received an AIS grant ("Aide à installation scientitifique") from the region of Brittany.
- The papers [31], [28] have been recognized as “Top 10%” at the IEEE international conference ICIP 2015.

STARS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

This year Stars has proposed new algorithms in the domains of perception for activity recognition and semantic activity recognition.

5.1.1. Perception for Activity Recognition

For perception, the main achievements are:

- A new Re-Identification algorithm which outperforms the State-of-the-art algorithms while being adapted to real-world applications (i.e. it does not require the use of heavy manual annotations which is typical of metric learning algorithms). The remaining challenge is to be able to distinguish people who have similar appearance.
- A new generic action recognition algorithm which outperforms the State-of-the-art algorithms. This algorithm uses new action descriptors that enable finer gesture classification. An open issue is to get a real-time implementation with good enough performance. An extension of this algorithm has been devised for RGB-D cameras, which has been demonstrated in a real-life application, where a robot has to recognize people taking their meal (e.g. eating, drinking).
- New generic tracking algorithms, which can optimize the on-line tuning of tracking parameters and can operate at different temporal scales to recover from lost tracklets. These tracking algorithms have been validated on real world videos lasting more than a week. The utilization of such sophisticated algorithms is still complex and requires some more researches for their deployment in a large variety of applications.

5.1.2. Semantic Activity Recognition

For activity recognition, the main advances on challenging topics are:

- New tools to help modeling human activities of daily living. These tools enable to evaluate and improve activity recognition algorithms on long videos depicting the performance of older people living in a nursing home in Nice. The utilization of these tools by clinicians and medical doctors is an ongoing task.
- A new algorithm to recognize human activities, that can benefit from the fusion of events coming from camera networks and heterogeneous sensors.
- A new algorithm to discover human activities of daily living by processing in an unsupervised manner a large collection of videos. The generation of the event models does not require the use of heavy manual annotations which is typical of supervised activity recognition algorithms. However this algorithm still need to have well tracked people to be able to understand their behaviors with sufficient precision.

WILLOW Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

J. Sivic has served as a Program Chair for International Conference on Computer Vision, Santiago, Chile, 2015