

Research areas

I am interested in expression through computer graphics in general and more specifically in shape representations, geometry rendering, intuitive modeling and dynamic deformable objects. Through the years, I have contributed to the following areas :

- Continuous 3D shape representations: implicit surfaces and subdivision surfaces (1 TOG, 2 EG, 2 CGF, 1 CAGD, 1 C&G, ...).
- Intuitive modeling: incremental sketch-based modeling, direct surface reconstruction from a single sketch (1 C&G, ...).
- Animation: complex surface deformation for 3D animation (characters, fluids) (2 TOG, 1 SCA).
- Color manipulation: Color palette exploration and interpolation (1 TOG).
- Discrete unstructured 3D shape representation: point-based rendering and point-based surfaces (2 EG, 1 C&G, ...).
- Constructive Aided Geometric Design : huge CAD model real-time rendering (1 EG).
- Real-time rendering : soft shadow generation (2 EG, 2 EGSR, ...).
- Physically-based rendering : bidirectional path-tracing and Monte-Carlo integration (1 EG, 1 SIAM SISC, 1 IEEE TVCG, ...).

Education - Career

- since 2017:** Member of the direction committee of the CNRS research group in computer graphics, computational geometry, virtual reality and visualization (GDR IG-RV)
- since 2016:** Head of the Researcher and Teacher/Researcher Council of the IRIT (CPCEC). This council follows the careers and participates to the preparation of the IRIT evaluation.
- since 2015:** Member of the IRIT executive board responsible for the scientific policy.
- 2015:** Full Professor of the University Paul Sabatier of Toulouse.
- since 2015:** Associate member of the Inria project team Manao (Inria Sud-Ouest).
- since 2015:** Affiliated member of the Computer Graphics Group of the University of Victoria (Canada).
- since 2014:** President of the Eurographics French Chapter. Member since 2007 and vice-president from 2009 to 2012.
- since 2013:** Scientific Excellence Reward (PES rank A).
- since 2012:** Co-head of the VORTEX group (23 titular members) of the IRIT. Head of the 8 titular members (4 Professors, 3 Associate professors and 1 Researcher) located at the Université Paul Sabatier (other members of the group are located at different Universities).
- 2011:** Habilitation à Diriger les Recherches « Models for the intuitive and interactive modeling of tridimensional objects », Université Paul Sabatier, Toulouse.
- 2009-2013:** Scientific Excellence Reward (PES rank B).
- 2008-2010:** Head of the education committee of Images, Sound and Human Machine Interface (covering around 70 students in License and Masters per year) in the Computer Science Education Department of the Université Paul Sabatier.
- 2007-2012:** Head of the 3D Computer Graphics education in Masters 2nd years (7 to 14 students per year).
- 2006-2009:** Head of the Researcher and Teacher/Researcher Council of the IRIT (CPCEC).
- 2003:** Associate Professor at the Université Paul Sabatier de Toulouse.
- 2002-2003:** Post-doc in collaboration with Leif Kobbelt at the RWTH University of Aachen (Germany).
- 2001-2002:** Post-doc in collaboration with Malcolm Sabin and Neil Dodgson at the University of Cambridge (UK).
- 2000-2001:** Assistant Professor at the Université Paul Sabatier de Toulouse.
- 2000:** PhD at the Université Paul Sabatier de Toulouse under the supervision of Véronique Gaidrat.

Additional scientific responsibilities

- since 2017:** Organizer of the national PhD award in computer graphics, computational geometry, virtual reality and visualization (together with David Coeurjolly).
- since 2014:** Member of the prospective committee of the Labex CIMI (Laboratory of Excellence – International Center of Mathematics and Computer Science in Toulouse).
- 2014:** Member of the internal evaluation committee of the IRIT.
- 2013-2015:** Member of the career promotion committee of the Université Paul Sabatier for Computer Science and Mathematics.
- 2012-2015:** Member of the Doctoral School EDMITT evaluation committee.
- 2011:** Member of the CIMI Labex Project (Laboratory of Excellence – International Center of Mathematics and Computer Science) writing committee.
- 2008-2015:** Member of the board of the Collège Scientifique 27^{ème} Section of the Université Paul Sabatier. This Collège is responsible for the creation of the selection committees (doing the interviews) for hiring new associate professors and professors. Board members are also members of these selection committees.
- 2005-2010:** Member of the IRIT Laboratory Council.

Additional education responsibilities

- since 2015:** Member of the improvement council of the Engineering Master of the Computer Science Department.
- 2015:** Member of the working group preparing the creation of a special License/Master in mathematics and computer science.
- 2014-2015:** Member of the working group structuring and indexing mediation actions at the Université Paul Sabatier.
- 2014:** Member of the writing committee for the legal status of the Research Institut for Teaching Science of Toulouse (IRES). This is an evolution of the Research Institut for Teaching Mathematics of Toulouse (IREM).
- 2013-2015:** Member of the University ↔ Schools Relation Council of the Université Paul Sabatier.
- 2007-2012:** Member of the Computer Science Educational Council of the Université Paul Sabatier
- since 2007:** Responsible for 3 to 5 teaching units (20 to 30 hours each) per year in the Computer Science Department of the Université Paul Sabatier.

Scientific assessment

- Associate Editor for the international Journal Computer Graphics Forum (CGF) since 2017.
- Associate Editor for the international journal Computer & Graphics (C&G) since January 2016.
- Associate Editor for the international journal Graphical Models (GMOD) since 2010.
- Full paper chair for Eurographics 2017.
- Member of the best paper award jury for the international conference Geometric & Physical Modeling 2011.
- Seminar at Collège de France (27/02/2015) during Marie-Paule Cani lecture series (<http://www.college-de-france.fr/site/marie-paule-cani/seminar-2015-02-27-11h30.htm>).
- Study and procedure proposal for the organization of a best PhD award for the CNRS working group on Computer Graphics and Virtual Reality (GDR IG-RV) in January-May 2016 with David Coeurjolly. This award will start in 2017 and I will be its organization co-chair with David Coeurjolly.
- Associate Editor for the Revue Electronique Francophone d'Informatique Graphique (REFIG) in 2014 and 2015.
- Co-Chair of the best paper award jury for the national conference AFIG/EGFR since 2005 and chair of its organization committee from 2011 to 2015.

- Member of 41 Program Committees for international conferences since 2005 (Siggraph 2017, SMI-FALSE 2015 to 2017, CAD/Graphics 2017, 2015, Expressive 2013 à 2017, CASA 2017, 2016, CGI 2015 to 2017, Eurographics 2016, SMI 2015, 2014, 2010, 2005 to 2008, WSCG 2012 to 2015, GD/SPM 2013, SBIM 2012, 2011, 2008, GI 2012, 2011, Siggraph Asia S&P 2011, 2010, EWNP 2009, 2008, SPBG 2006 to 2008).
- Editor for the CNRS (National Center of Scientific Research) Geometric Modeling national Workshop in 2009.
- Editor for the national conference AFIG in 2008.
- Reviewer for more than 25 submissions per year for international journals and conferences in computer graphics including Siggraph, Siggraph Asia, Transactions on Graphics, Eurographics, IEEE Transactions on Visualization and Computer Graphics, Computer Graphics Forum, Computer Aided Geometric Design, etc.
- International expert for the Canadian Killam Research Fellowship 2017 (<http://killamprogram.canadacouncil.ca/en>).
- International expert for the Italian ANVUR (Agenzia Nazionale di Valutazione del Sistema Universitario e della Ricerca, National agency for the Universities and research evaluation) since 2016.
- Expert for the High Council for Evaluation of Research and Higher Education (HCERES) since 2015. Evaluation of the IRISA Laboratory and the INSERM unit VisAGeS in January 2016.
- Expert for the National Research Agency (ANR) for thematic calls (COSINUS, CONTINT, JCJC-young researchers) since 2009.
- Expert for the Regional Research and Technology Council (Délégation Régionale à la Recherche et à la Technologie Midi-Pyrénées and Languedoc-Roussillon) for Innovative Young Companies (JEI) and National Research Taxes Refunds (CIR) since 2009.
- Member of a selection committees for hiring a Professor at Université Claude Bernard Lyon 1 in 2017.
- Member of 11 selection committees for hiring Associate Professors. 8 at the Université Paul Sabatier since 2009, 2 at the Université d'Aix-Marseille (2013, 2014) and 1 at the Université de Bordeaux 1 in 2013.
- Member of a selection committee for a Chair of Excellence CNRS/MCF at the University of Strasbourg in 2009.
- Reviewer for 2 Habilitation à Diriger les Recherches (Benoît Crespin in 2016 and Romain Raffin in 2013).
- Reviewer for 13 PhD since 2012.
- Examiner in 6 PhD juries since 2008.

Projects

- Member of the CALiTrOp ANR project, 2017-2021.
- Responsible for the Fold-Dyn ANR project, 2017-2020.
- Responsible for the Labex CIMI project DEMAGOS-3D, 2015-2018.
- Member of the R&T MNS project with the National Center of Spatial Studies (CNES) and Telespazio, 2013-2014.
- Responsible for the IM&M ANR-11-JS02-007 project (young researchers program), 2012-2016.
- Member of the ANR Contint project NatSim, 2006-2009.

Supervision, Visits and Collaborations

- Research post-doc : Nadine Aburumman (2017-2018).
- 8 Defended PhD: Gaël Guennebaud (2005), Anca Alexe (2005), Vincent Forest (2008), Anthony Pajot (2012), Frédéric Claux (2014), Olivier Gourmel (2015), Rodolphe Vaillant (2015), Florian Canezin (2016).
- 5 ongoing PhD: Even Entem (since 11/2013), Maurizio Kovacic (since 09/2014), Valentin Roussellet (since 11/2014), Baptiste Angles (since 01/2016), Tibault Lejemble (starting in 09/2017).
- Supervision of 15 Master students (second year) for research projects or internships in the industry since 2004.
- These ongoing PhD include 2 co-tutelle with the University of Victoria (Canada): Morizio Kovacic and Baptiste Angles.

- Visiting Researchers: Marie-Paule Cani (about 1 or 2 days per year since 2010), Riccardo Scateni (3 days in 02/2016), Francesco Usai (1 month in 03/2016 – 04/2016), Alla Sheffer (5 days in 03/2017), Brian Wyvill (2 days in 2009, 4 days in 10/2015, 2 days in 05/2017 and 2 month in 03/2018 and 04/2018).
- I have been invited as invited Professor at the University of Cagliari (1 month in 07/2017).
- Ongoing collaborations: Brian Wyvill (since 2003, University of Victoria, Canada), Marie-Paule Cani (since 2005, Grenoble Universités, LJK, Inria), Gaël Guennebaud (since 2010, Inria Bordeaux), Michiel van de Panne (since 2014, University of British Columbia, Canada), Riccardo Scateni (since 2016, Università di Cagliari, Italy), Andrea Tagliasacchi (since 2016, University of Victoria, Canada).
- Ended collaborations: Neil Dodgson (2001-2005, University of Cambridge, UK), Malcolm Sabin (2001-2005, Numerical Ltd, UK), Leif Kobbelt (2002-2005, RWTH technical University of Aachen, Allemagne), Pierre Poulin (2009-2011, Université de Montréal, Canada), Mario Botsch (2009-2013, University of Bielefeld, Germany), Frédéric Cordier (2013-2015, Université de Haute Alsace).

Teaching

- 60 % of lectures are given in computer graphics in Masters at the Université Paul Sabatier (Department of Computer Science): Fundamentals of multimedia (directed works), Fundamentals of computer graphics, Fundamentals of geometric modeling, Advanced geometric modeling.
- 40 % in programming in License at the Université Paul Sabatier (Department of Computer Science). Imperative programming, data structures, projects.
- A total of about 225 hours per years are given in general. In 2013, 2014 and 2015, only 110 hours were given (96 hours were not done) to support the management and the researches in the project IM&M.
- I give a lecture in geometric modeling at the engineer school ISAE-SupAero (20 hours per year) since 2004.
- I gave a lecture on subdivision surfaces and 3D scalar fields for animation in the Master of Computer Graphics at the Université de Montpellier 2 (3 to 9 hours) from November 2014 to December 2016.

Free codes and transfer

Details are provided at the following URL : <http://www.irit.fr/~Loic.Barthe/transfer.php>

since 11/2014 : Transfer : Professional development of the Implicit Skinning (version Siggraph Asia 2014) with Toulouse Tech Transfer. This development is done in partnership with an international animation software editor. It should be commercialized in March 2016.

since 10/2014 : Free codes : We provide the Implicit Skinning codes (version Siggraph 2013) under GNU GPL License.

since 03/2014 : Free codes : We provide the codes for our integration library GACVL under GNU GPL License.

since 02/2014 : Free codes : We provide the Implicit Skinning codes (version Siggraph 2013) under Academic Only License.

since 02/2014 : Free codes : We provide the codes for our composition operators for implicit surfaces under Academic Only License.

Scientific mediation

- Participation to a movie/debate at the Utopia cinema (Mars 2016).
Movie “Le Congrès” (http://www.allocine.fr/film/fichefilm_gen_cfilm=141806.html) and debate around virtual reality with scientists and artists.
- I regularly give presentations at school or for the large public in order to explain in what mathematics can be useful in computer graphics. The goal is to try to make mathematics more attractive through visually appealing applications and scientific results. Another goal is to try to explain what research is about, how it works and why it is important and useful in our society. See more here : <http://www.irit.fr/~Loic.Barthe/presentations.php>
 - Primary school :
 - 1 full day workshop (in 2015) with the children in which they discover regular polyhedrons, the Euler formula and the 3D objects representation capabilities of polyhedrons. The day ends with illustrations on video games, animation movies and 3D printing.

- 1 workshop (in 2014) with the children in which they discover the subdivision principle by themselves, we develop a mathematical formalism, they apply it and I present several applications in computer graphics.
- 3 presentations (in 2005, 2012, 2013) on "Where is science hided in animation movies ?". Based on subdivision surfaces and proportions.
- Middle school :
 - 3 presentations (in 2010, 2012, 2013) on "Animation movies and video games : from theory to practical use". Based on Implicit surfaces and composition operators (linear and quadratic polynomial equations, Ricci's min/max operators).
 - 2 presentations (in 2013, 2014) on "Researcher and research". This presentation explains what research is about and how researchers work.
- Invited presentations for large public : 2 presentations (Limoges in 2013 and Poitier in 2014) entitled "For a fold". Based on equations of spheres, Radial Bases Functions, Gradients, Implicit Skinning.
- A paper on "from the sphere equation to the animation of virtual characters" has been published in the SIF Bulletin 1024 (in French).
- The project « implicit skinning » developed under my supervision and partially funded by the IM&M project has been selected to be presented in the CNRS activity report 2013.

Major recent publications

The complete list of publications with additional material can be found here : <http://www.irit.fr/~Loic.Barthe/publications.php>

- N. Mellado, D. Vanderhaeghe, C. Hoarau, S. Christophe, M. Bredif and L. Barthe. "Constrained Palette-Space Exploration", ACM Transactions on Graphics, 36(4), proc. of ACM SIGGRAPH, 2017.
- F. Canezin, G. Guennebaud and L. Barthe. "Topology-Aware Neighborhoods for Point-Based Simulation and Reconstruction", Eurographics/ACM Siggraph Symposium on Computer Animation, 2016.
- R. Vaillant, G. Guennebaud, L. Barthe, B. Wyvill and M.P. Cani. "Robust Iso-Surface Tracking for Interactive Character Skinning", ACM Transactions on Graphics, 33(6), proc. of ACM SIGGRAPH ASIA, 2014.
- A. Pajot, L. Barthe and M. Paulin. "Globally Adaptive Control Variate for Robust Numerical Integration", SIAM Journal on Scientific Computing, 36(4), pages A1708-A1730, 2014.
- F. Claux, L. Barthe, D. Vanderhaeghe, J. Jessel and M. Paulin. "Crack-free rendering of dynamically tessellated B-Rep models", Computer Graphics Forum, 33(2), proc. of EUROGRAPHICS, pages 263-272, 2014.
- E. de Groot, B. Wyvill, L. Barthe, A. Nasri and P. Lalonde. "Implicit Decals: Interactive Editing of Repetitive Patterns on Surfaces", Computer Graphics Forum, 33(1), pages 141-151, 2014.
- R. Vaillant, L. Barthe, G. Guennebaud, M.P. Cani, D. Rhomer, B. Wyvill, O. Gourmel and M. Paulin. "Implicit Skinning: Real-Time Skin Deformation with Contact Modeling", ACM Transactions on Graphics, 32(4), proc. of ACM SIGGRAPH, 2013.
- O.Gourmel, L. Barthe, M.P. Cani, B. Wyvill, A. Bernhardt, M. Paulin and H. Grasberger. "A Gradient-Based Implicit Blend", ACM Transactions on Graphics, 32(2), presented at SIGGRAPH in July 2013.
- A. Pajot, L. Barthe, M. Paulin and P. Poulin. "Combinatorial Bidirectional Path-Tracing for Efficient Hybrid CPU/GPU Rendering", Computer Graphics Forum, 30(2), proc. of EUROGRAPHICS, pages 315-324, 2011.
- A. Pajot, L. Barthe, M. Paulin and P. Poulin. "Representativity for Robust and Adaptive Multiple Importance Sampling", IEEE Transactions on Visualization and Computer Graphics, 17(8), pages 1108-1121, 2011.
- O. Gourmel, A. Pajot, M. Paulin, L. Barthe and P. Poulin. "Fitted BVH for Fast Raytracing of Metaballs", Computer Graphics Forum, 29(2), proc. of EUROGRAPHICS, pages 281-288, 2010.
- A. Bernhardt, L. Barthe, M-P. Cani and B. Wyvill. "Implicit Blending Revisited", Computer Graphics Forum, 29(2), proc. of EUROGRAPHICS, pages 367-376, 2010.