Curriculum Vitae

English Version

Rémy Malgouyres

Laboratoire d'Algorithmique et Image de Clermont-Ferrand,

IUT département Informatique,

B.P. 86

63172 Aubière cedex

France

Remy.Malgouyres@laic.u-clermont1.fr

http://laic.u-clermont1.fr/~mr

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Contents

1 Personal details

Name: MALGOUYRES
First name: Rémy

Born in 1967 in Étampes (France)
Nationality: French

Remy.Malgouyres@laic.u-clermont1.fr
http://laic.u-clermont1.fr/˜mr

Professional address:
Rémy Malgouyres
LAIC,
IUT département Informatique,
B.P. 86
63172 Aubière cedex
France

Current position: Full tenured professor

Languages: French (mother tongue), English (read, written, spoken, proficient), German (fluent)

2 Education

1990	• *MS Mathematics (research master)* With Honors from Ecole Normale Supérieure de Lyon
	• *Agrégation de Mathématiques* (National competitive exam for high-school and prep permanent teaching position, National rank 61)
1994	• *PhD in Computer Science*
	Title: "A new characterization of surfaces in the digital space $\mathbb{Z}^3$ leading to a 3D discrete Jordan Theorem" Advisor : Professor Denis Richard.
	With Honors.
1999	• *Habilitation Degree in Computer Science*
	Title: "Topology preservation and surfaces in discrete geometry".

3 Employment History

- From 1987 to 1991   Student at the Ecole Normale Supérieure de Lyon

- From 1991 to 1994   PhD student grant (AMN)

- 1994-1995   Temporary research and teaching position (ATER) at Université d'Auvergne

- 1995-2000   Permanent Associate Professor in Computer Science at the ENSI de Caen

- Since September 2000   Full Professor in Computer Science
at the Université d'Auvergne (IUT de Clermont-Ferrand).

- Since September 2008   First Class Professor.

4 Research since 2000

Thematic Mobility

My PhD dealt with discrete surfaces, and I kept working on digital topology as an associate professor. Since 2000, as a full professor, I work on computer graphics and geometric modeling, and my research has is much more applications oriented.

i) Geometric Modeling

With my PhD student J. Burguet, we provided new tools for geometric modeling, mesh reconstruction from voxel models, boolean operations on meshes.

With my PhD student T. Marzais, we reconstructed parametric surfaces from non structured sets of points. We obtained optimal uniform errors for reconstruction of G^1 piecewise Bézier of any possible topology.

ii) Voxel-based Global Illumination

I proposed in 2001 a new approach to Global Illumination, called Voxel-based Global Illumination. The method consists in a new discretization technique of the global illumination equation using a voxel approximation of the surfaces. The **computational complexity** is better than that of methods based on ray-object intersections.

With my PhD students, we explored General BRDFs, parallel implementation, and rendering for this method. This work is currently continued with a new PhD student working on animations. GPGPU acceleration is considered.

iii) Integer-Only Methods in Signal Processing

With S. Fourey, I proposed a methods for computing normals to voxel objects based on convolutions on a discrete surface. We proved convergence with F. Brunet. This ideas can extend to a general integer only approach to signal processing, leading to numerically stable solutions to ill-posed problems. A large proposal has been submitted to the French National Research Agency under my leadership on this topic.

iv) 3D visualization and modelling for neurosurgery

I am co-advising the industrial PhD thesis of F. Tixier with *Brainlab* for design of a stereographic interface for planning and control in neurosurgery.

5 Publications

5.1 Textbooks

[1] R. Malgouyres, R. Zrour, and F. Fecshet. *Initiation à l'Algorithmique et aux structures en données en C : cours et 118 exercices corrigés*. Collection Sciences Sup. DUNOD, janvier 2008.

[2] R. Malgouyres. *Algorithmes pour le synthèse d'images et l'animation 3D*. Collection Sciences Sup. DUNOD, 2ème edition, 2005.

[3] R. Malgouyres. *Algorithmes pour le synthèse d'images et l'animation 3D*. Collection Sciences Sup. DUNOD, 2002.

5.2 Book Chapters

[1] J-O Lachaud and R. Malgouyres. *Géométrie discrète et images numériques*, chapter 3. Hermès, 2007.

5.3 Special issue edition

[1] G. Bertrand and R. Malgouyres eds, editors. *Special issue on Discrete Geometry*, volume 283/1. Theoretical Computer Science, Elsevier, 2002.

[2] R. Malgouyres, editor. *Special issue on combinatorial analysis*, volume 15/7. International Journal on Pattern Recognition and Artificial Intelligence, 2001.

5.4 Publications in international journals

[1] Sébastien Fourey and Rémy Malgouyres. Normals estimation for digital surfaces based on convolutions. *Computers & Graphics*, 33:2–10, 2009.

[2] Pierre Y. Chatelier and Rémy Malgouyres. A low-complexity discrete radiosity method. *Computers & Graphics*, 30(1):37–45, 2006.

[3] J. Burguet and R. Malgouyres. Strong Thinning and Polyhedric Approximation of the Surface of a Voxel Object. *Discrete Applied Mathematic*, 125(1):93–114, 2003.

[4] S. Fourey and R. Malgouyres. A Concise Characterization of 3D Simple Points. *Discrete Applied Mathematics*, 125(1):59–80, 2003.

[5] S. Fourey and R. Malgouyres. Intersection Number and Topology Preservation Within Digital Surfaces. *Theoretical Computer Science*, 283(1):109–150, 2002.

[6] R. Malgouyres and M. More. On the Computational Complexity of Reachability in 2D Binary Images and Some Basic Problems of 2D Digital Topology. *Theoretical Computer Science*, 283(1):67–108, 2002.

[7] S. Fourey and R. Malgouyres. A digital Linking number. *International Journal on Pattern Recognition and Artificial Intelligence*, 15(7):1053–1074, 2001.

[8] R. Malgouyres. Computing the Fundamental Group in Digital Spaces. *International Journal on Pattern Recognition and Artificial Intelligence*, 15(7):1075–1088, 2001.

[9] R. Malgouyres. Homotopy in 2-dimensional digital images. *Theoretical Computer Science*, 230:221–233, 2000.

[10] R. Malgouyres and A. Lenoir. Topology Preservation Within Digital Surfaces. *Graphical Models*, 62:71–84, 2000.

[11] G. Bertrand and R. Malgouyres. Some topological properties of discrete surfaces. *Journal of Mathematical Imaging and Vision*, 11:207–221, 1999.

[12] R. Malgouyres and G. Bertrand. Complete local characterization of strong 26-surfaces: continuous analogs for strong $26-$surfaces. *International Journal on Pattern Recognition and artificial Intelligence (IJPRAI), special issue on Parallel Image Analysis*, 13(4):465–484, 1999.

[13] R. Malgouyres and G. Bertrand. A new Local Property of strong n-surfaces. *Pattern Recognition Letters*, 20:417–428, 1999.

[14] R. Malgouyres. Local characterization of strong surfaces within strongly separating objects. *Pattern Recognition Letters*, 19(3-4):341–349, 1998.

[15] R. Malgouyres. A definition of surfaces of $\mathbb{Z}^3$: a new 3D discrete Jordan theorem. *Theoretical Computer Science*, 186:1–41, 1997.

[16] R. Malgouyres. There is no local characterization of separating and thin objects in $\mathbb{Z}^3$. *Theoretical Computer Science*, 163:303–308, 1996.

[17] R. Malgouyres. Graphs generalizing closed curves with linear construction of the Hamiltonian cycle. *Theoretical Computer Science*, 143:189–249, 1995.

[18] R. Malgouyres. Le graphe partiel essentiel par rapport au problème des cycles Hamiltoniens. *Compte Rendus de l'Académie des Sciences, Paris*, 309(1):405–410, 1994.

5.5   Selective international conferences

[1] F. Brunet, A. Bartoli, R. Malgouyres, and N. Navab. NURBS Warps. In *Proceedings of the Twentieth British Machine Vision Conference*, London, UK, September 2009.

[2] Henri-Alex Esbelin and Rémy Malgouyres. Convergence of Binomial-Based Derivative Estimation for C^2 Noisy Discretized Curves. In *In Proceedings of Discrete Geometry for Computer Imagery, DGCI'09*, LNCS, 2009.

[3] Łukasz Piwowar and Rémy Malgouyres. Cached Multi-Bounce Solution An Reconstruction For Voxel-Based Global Illumination. In *In Proceedings of the 4th International Conference on Computer Graphics Theory and Application, GRAPP'09*, pages 173–178, 2009.

[4] Jean-Luc Toutant and Rémy Malgouyres. Characterization of Simple Closed Surfaces in $\mathbb{Z}^3$: A New Proposition With a Graph-Theoretical Approach. In *In Proceedings of Discrete Geometry for Computer Imagery, DGCI'09*, LNCS, 2009.

[5] Florent Brunet, Adrien Bartoli, Rémy Malgouyres, and Nassir Navab. L-Tangent Norm: A Low Computational Cost Criterion for Choosing Regularization Weights and its Use for Range Surface Reconstruction. In Stephan Gumhold, Jana Kosecka, and Olivier Staadt, editors, *3D Data Processing, Visualization and Transmission (3DPVT)*, 2008.

[6] S. Fourey and R. Malgouyres. Normals and Curvature Estimation for Digital Surfaces Based on Convolutions. In *Discrete Geometry for Computer Imagery, LNCS*, volume 4992, pages 287–298, 2008.

[7] R. Malgouyres, F. Brunet, and S. Fourey. Binomial Convolutions and Derivatives Estimation from Noisy Discretizations. In *Discrete Geometry for Computer Imagery, LNCS*, volume 4992, pages 370–379, 2008.

[8] R. Malgouyres and A.R. Francés. Deciding Whether a 3D Simplicial Complex Collapses to a Point is $NP-$complete. In *Discrete Geometry for Computer Imagery, LNCS*, volume 4992, pages 177–188, 2008.

[9] P. Chatelier and R. Malgouyres. A Fast Interpolation Method to Represent BRDF in Global Illumination. In *GRAPP*, pages 5–12, 2007.

[10] Thibault Marzais, Yan Gérard, and Rémy Malgouyres. The Challenges of Surface Reconstruction. In *Curves and Surfaces*, 2006.

[11] Thibault Marzais, Yan Gérard, and Rémy Malgouyres. LP fitting approach for reconstructing parametric surfaces from points clouds. In *GRAPP*, pages 325–330, 2006.

[12] Rita Zrour, Pierre Y. Chatelier, Fabien Feschet, and Rémy Malgouyres. Parallelization of a Discrete Radiosity Method. In *Euro-Par*, pages 740–750, 2006.

[13] Rita Zrour, Fabien Feschet, and Rémy Malgouyres. Parallelization of a Discrete Radiosity Method Using Scene Division. In *OTM Conferences (2)*, pages 1213–1222, 2006.

[14] P. Chatelier and R. Malgouyres. A Low Complexity Discrete Radiosity Method. In *Proceedings of DGCI 2005*, volume 3429 of *LNCS*, pages 392–403. Springer, 2005.

[15] J. Burguet and R. Malgouyres. Multi-scale Discrete Surfaces. In *Proceedings of DGCI'2002*, volume 2301 of *LNCS*, pages 338–349. Springer, 2002.

[16] R. Malgouyres. A Discrete Radiosity Method. In *Proceeding of DGCO'02*, volume 2301 of *LNCS*, pages 428–439. Springer, 2002.

[17] S. Fourey and R. Malgouyres. A linking number for discrete curves. In *proceedings of IWCIA'2000, Caen*, July 2000.

[18] R. Malgouyres. Computing the Fundamental Group in Digital Spaces. In *proceedings of IWCIA'2000, Caen*, July 2000.

[19] J. Burguet and R. Malgouyres. Strong Thinning,Polyhedrization of the surface of a Voxel Object. In *Proceedings of DGCI'00, Uppsala, Sweden*, volume 1953 of *LNCS*, pages 222–234. Springer, 2000.

[20] S. Fourey and R. Malgouyres. A Concise Characterization of 3D Simple Points. In *Proceedings of DGCI'2000, Uppsala, Sweden*, volume 1953 of *LNCS*, pages 27–36. Springer, 2000.

[21] S. Fourey and R. Malgouyres. Intersection Numbers,Topology Preservation within surfaces. In *Proceedings of IWPIPA'99, Madras, Inde*, January 1999.

[22] S. Fourey and R. Malgouyres. Intersection Number for paths lying on a Digital Surface,a new Jordan theorem. In *Proceedings of DGCI'99*, volume 1568 of *LNCS*, pages 104–117, 1999.

[23] R. Malgouyres. Presentation of the Fundamental Group in Digital Surfaces. In *Proceedings of DGCI'99*, volume 1568 of *LNCS*, pages 136–150. Springer, 1999.

[24] R. Malgouyres and S. Fourey. Strong Surfaces, Surface Skelettons and Images Superimposition. In *Vision Geometry VII*, SPIE proceedings series, pages 16–27, 1998.

[25] R. Malgouyres and A. Lenoir. Topology Preservation Within Digital Surfaces. In *Proceedings of Computer Graphics and Image Processing*, Machine GRAPHICS & VISION, pages 417–425, 1998.

[26] R. Malgouyres and G. Bertrand. Complete local characterization of strong $26-$surfaces: continuous analogs for strong $26-$surfaces. In *proceedings of IWPIA'97, Hiroshima*, September 1997.

[27] G. Bertrand and R. Malgouyres. A local property of strong surfaces. In R. A. Melter, A. Y. Wu, and L. J. Latecki, editors, *Vision Geometry VI*, volume 3168 of *SPIE proceedings series*, 1997.

[28] R. Malgouyres. Homotopy in 2-dimensional digital images. In *proceedings of DGCI'97*, volume 1347 of *LNCS*, pages 213–222, 1997.

[29] G. Bertrand and R. Malgouyres. Some topological properties of discrete surfaces. In *Proceedings of DGCI'96, Lyon*, volume 1176 of *LNCS*, pages 325–336, 1996.

[30] A. Lenoir, R. Malgouyres, and M. Revenu. Fast computation of the normal vector field of the surface of a 3D discrete object. In *Proceedings of DGCI'96, Lyon*, volume 1176 of *LNCS*, pages 101–112, 1996.

[31] R. Malgouyres. There is no local characterization of separating and thin objects in $\mathbb{Z}^3$. In *Proceedings of DGCI'95*, Clermont-Ferrand, October 1995.

[32] R. Malgouyres. About Surfaces in $\mathbb{Z}^3$. In *Proceedings of IWPIA'94*, University of Mariland, June 1994.

6 PhD and Master students

6.1 Master thesis

1. *2007* Florent Brunet. Subject: Derivatives computation from a discrete signal.

2. *2005* Fabien Tixier. Subject: A patch-based radiosity method of weak complexity.

3. *2004* Thibault Marzais. (co-advised by Yan Gérard, Clermont 1) Subject: Linear Programming method for best approximation by polynomial surfaces.

4. *2003* (*"Magisterium"* Polish Master Thesis) Łukasz Piwowar. Subject: Adaptative discretization and optimization of discrete radiosity.

5. *2003* (*"Magisterium"*, Polish Master Thesis) Marcin Wrzeszcz, Subject: Comparison of voxel-based radiosity with other radiosity techniques.

6. *2000* Tony Gallon. Subject: Algorithmic characterization of 3D voxel objects with trivial fundamental group.

7. *1999* Jasmine Burguet. Subject: Parallel thinning within digital surfaces.

8. *1997* Sébastien Fourey. Subject: Homotopy, discrete surfaces and thinning: a medical application.

9. *1995* Luc Milotte. Subject: Visualization of discrete surfaces.

6.2 Ongoing PhDs

1. Advice at 80% of the PhD of Maciej Mostowski (began in September 2008). Subject: Animation and hardware acceleration for voxel-based global illumination.

2. Advice at 10% of the PhD of Florent Brunet, co-avised with Adrien Bartoli (LASMEA, UBP) and Nassir Navab (Professor, TU München, Germany) (began in September 2007). Subject: Robust surface reconstruction and fusion of depth-color information in computer vision.

3. Advice at 50% of the industrial PhD of Fabien Tixier (began in September 2006). Industrial funding *Brainlab*. Subject: Stereographic interface for neurosurgery co-advised by Professor Jean-Jacques Lemaire (neurosurgeon).

4. Advice et 100% (since September 2003) of the PhD student Łukasz Piwowar. Subject: Reconstruction and Shooting for voxel-based global illumination.

6.3 Completed PhDs

1. Advice at 50% (since September 2004) of Thibault Marzais. Co-advised with Yan Gérard (Clermont 1). PhD defended on December 4, 2008. Title : LP-fitting for parametrised surface reconstruction.

2. Advice at 40% (thesis initiated in September 2004 and defended in October 2007) of Rita Zrour. Co-advised with Fabien Feschet (Université Clermont 1). Title: Parallel algorithms for voxel-based global illumination.

3. Advice at 100% (thesis initiated in 2003 and completed in December 2006) of Pierre-Yves Chatelier. Title: Optimal linear complexity for voxel based radiosity and application to graphics.

4. Advice at 100% of Jasmine Burguet, thesis initiated in 1999 and defended on December 19, 2002. Title: Multi-scale Discrete surfaces, thinning, mesh approximation and boolean operations on meshes.

5. Advice at 100% of Sébastien Fourey (thesis initiated in September 1997 and defended in July 2000). Title: Intersection and winding number of curves and application to topology preservation characterization in imaging.

6. Advice at 50% from 1995 to 1999 of Alexandre Lenoir Co-advised by M. Revenu. Subject: Geometric invariant computation on discrete surfaces.

7 Teaching Activity

Teaching in France is flat rate at 192 hours per year.
Details of the number of hours for the different courses, as well as a precise description of the public can be found in the French version of my CV. It can be downloaded from my web page. Teaching documents and material can be downloaded as well.

- 3D Graphics with OpenGL (lectures and practicals, master level)

- Algorithms for 3D graphics (lecture, master level).

- Geometric modeling with Bezier and Splines (lecture and practicals, BS level)

- Computer vision for robotics (Lecture and practicals, BS level)

- Programming, Algorithms, data structures in C (lecture and practicals, BS and MS levels).

- Object oriented programming in C++ (practicals, MS level).

- Visual C++ programming (lectures and practicals, BS and MS level).

- System and network programming in C under linux (POSIX) (Lecture and practicals, BS level)

- Network administration with linux (practicals, BS level)

- Mathematics for information technology (lecture, BS level)

- Advanced algorithms on graphs (Lecture, MS level).

- Discrete Geometry (lecture, MS level)

8 Responsibilities

A higher level of details can be found in the French version of my CV.

8.1 Head of the LAIC research lab since 2006

The LAIC (Laboratoire d'Algorithmique et d'Image de Clermont-Ferrand, $EA2146$) has 16 permanent researcher and currently 8 PhD students. It consists of two groups : the Imaging group and a Theoretical Computer Science group (which is smaller).

8.2 Leader of the DIGICO ANR Proposal

The proposal DIGICO (Digital Convolutions For Signal and Image Processing) is currently submitted to the French National Research Agency (ANR). It involves the following labs: LAIC, LIRMM, LORIA, GREYC, LAMA, IGM.

8.3 Scientific Animation

- Responsible since 2003 for recurrent national seminars on Discrete Geometry.

- Initiator of "Journées de Géométrie Algorithmique et Discrète", and then "Journées Informatiques et Géométrie", meetings which involve the French Computational Geometry Geometric Modeling and Discrete Geometry communities.

- Member of the program committee of DGCI (Discrete Geometry for Computer Imagery) since 1995.

- Member of the program committee of ICISP 2008 (International Conference on Image and Signal Processing).

- Session organizer at ROADEF'2008 in Clermont-Ferrand.

- Chair of the international conference IWCIA'2000 held in Caen on July 10-11, 2000.

8.4 Thesis and Habilitation Jury

Referee for 4 Habilitation degrees and 10 thesis, member of the jury of 3 thesis (plus my own students).

8.5 Administration

1. Since 2001, President of various committees in charge of hiring associate professors and professors.

2. Member of the Scientific Council of the Université Clermont 1 since 2004.

3. From 2005 to 2007, Member of the Direction committee of the Information Technology teaching department in my university.

In Aubière, June 26, 2009

Rémy Malgouyres