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1 General informations

Expertise : inverse problems, image analysis, shape and parameter identification, shape and topology optimization, free boundary problems, asymptotic analysis

Date and place of Birth : 08 June 1979, Nancy (France)

Nationality : French/Belgian

Marital status : single

Professional address : Humboldt-University of Berlin,
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2 Professional experiences

10/2010-... Wissenschaftlicher Mitarbeiter (Research fellow)
Department of Mathematics, Humboldt University of Berlin, Germany.

04/2010-10/2010 W2-Professorship (replacement position-Vertretungsprofessor),
University RWTH Aachen, Germany.

09/2006-04/2010 Postdoc in the START Project : "Interfaces and Free Boundaries",
University Karl-Franzens, Graz, Austria.

3 Education

- 2003-2006 **PhD in Mathematics**,
Dissertation : "Singularly perturbed domains in shape optimization"
Advisor : Jan Sokolowski, University Henri Poincaré, Nancy, France.
- 2002-2003 **MSc in Mathematics (DEA)**,
Partial differential equations-Probability,
University Henri Poincaré, Nancy, France.
- 2001-2002 **MA in Mathematics (Maîtrise)**,
University Henri Poincaré, Nancy, France.
- 2000-2001 **BA in Mathematics (Licence)**,
University Henri Poincaré, Nancy, France.
- 1997-2000 **Classes préparatoires MP**,
Lycée Fabert, Metz, France.
- 1997 **Baccalauréat série S spécialité Mathématiques**,
Lycée Fabert, Metz, France.

4 Publications

4.1 Refereed journals

- 12) - *A total variation based approach to correcting surface coil magnetic resonance images*
S.L. Keeling, M. Hintermüller, F. Knoll, D. Kraf, A. Laurain
Accepted for publication in Applied Mathematics and Computation (2011).
- 11) - *Optimal shape design subject to variational inequalities*
M. Hintermüller and A. Laurain
Accepted for publication in SIAM Journal on Control and Optimization (2011).
- 10) - *Second-order topological expansion for electrical impedance tomography*
M. Hintermüller, A. Laurain and A.A. Novotny.
Accepted in Advances in Computational Mathematics (2010).
- 9) - *On a Bernoulli problem with geometric constraints*
A. Laurain and Y. Privat
Accepted in ESAIM : Control, Optimisation and Calculus of Variations (2010).
- 8) - *Singular perturbations of curved boundaries in dimension three. The spectrum of the Neumann Laplacian.*
A. Laurain, S. Nazarov and J. Sokolowski,
Journal for Analysis and its Applications, Vol. 30 (2011), No. 2, pp. 148-180.
- 7) - *Multiphase image segmentation and modulation recovery based on shape and topological sensitivity*
M. Hintermüller and A. Laurain,
Journal of Mathematical Imaging and Vision, September 2009, Vol. 35, No. 1, pp. 1-22.

- 6) - *On analysis of boundary value problems in nonsmooth domains*
G. Frémiot, W. Horn, A. Laurain, M. Rao and J. Sokolowski,
Dissertationes Mathematicae, 462 (2009), 149 pp.
- 5) - *Electrical Impedance Tomography : From Topology to Shape*
M. Hintermüller and A. Laurain,
Control and Cybernetics, special issue on the occasion of Jean-Paul Zolésio's 60th birthday,
Vol. 37, No. 4, 2008.
- 4) - *A shape and topology optimization technique for solving a class of linear
complementary problems in function space*
M. Hintermüller and A. Laurain,
Computational Optimization and Applications, 2010, Vol. 46, No. 3, pp. 535-569
- 3) - *Levelset method with topological derivatives in shape optimization*
P. Fulmanski, A. Laurain, J.-F. Scheid and J. Sokolowski,
International Journal of Computer Mathematics, Vol. 85, No. 10, October 2008, pp. 1491-
1514(24).
- 2) - *A level set method in shape and topology optimization for variational inequalities*
P. Fulmanski, A. Laurain, J.-F. Scheid and J. Sokolowski,
Int. J. Appl. Math. Comput. Sci., 2007, Vol. 17, No. 3, 413-430.
- 1) - *Structure of shape derivatives in non-smooth domains and applications*
A. Laurain,
Advances in Mathematical Sciences and Applications, Vol.15, No.1, 2005.

4.2 Conference proceedings

- 5) - *Topological Derivative for Image Reconstruction in Fluorescence Tomography*
M. Freiberger, M. Hintermüller, A. Laurain and H. Scharfetter
44. DGBMT Jahrestagung Rostock (2010).
- 4) - *Numerical algorithms for an inverse problem in shape optimization*
M. Grzanek, A. Laurain and K. Szulc
6th International Conference on Inverse Problems in Engineering : Theory and Practice,
Journal of Physics : Conference series, Vol. 135 (2008) 012047.
- 3) - *Using self-adjoint extensions in shape optimization*
A. Laurain and K. Szulc
23rd IFIP TC7 Conference on System Modelling and Optimization.
- 2) - *Une méthode levelset en optimisation de formes*
P. Fulmanski, A. Laurain, J.-F. Scheid and J. Sokolowski
ESAIM proceedings, (2007), Vol. 22, 162-168.
- 1) - *Level set method for shape optimization of Signorini problem*
P. Fulmanski, A. Laurain and J.-F. Scheid
MMAR proceedings (2004), Vol. 1, 71-75.

4.3 Submitted

- 2) - *Principal Eigenvalue Minimization for an Elliptic Problem with Indefinite Weight and Robin Boundary Conditions*
M. Hintermüller, C.-Y. Kao, A. Laurain
University of Graz, IFB report no. 44, 2011.
Submitted to Applied Mathematics and Optimization.
- 1) - *An image space approach to Cartesian based parallel MR imaging with total variation regularization*
S.L. Keeling, C. Clason, M. Hintermüller, F. Knoll, A. Laurain, G. Von Winckel
Technical University of Graz, SFB report no. 2008-22, 2008.
Submitted to Medical Image Analysis.

4.4 Chapters in book

- 1) - *Electrical Capacitance Tomography. Theoretical Basis and Applications*
P. Fulmanski, A. Laurain, J-F Scheid, J. Sokolowski, K. Szulc
Topological derivatives and Levelset method in shape optimization, pp 12-67
Dominik Sankowski and Jan Sikora, Eds, Wydawnictwo Ksiazkowe Instytutu Elektrotechniki
Warszaw 2010, ISBN 978-83-61956-00-6

4.5 Technical reports

- 1) - *Modulation recovery and image reconstruction in Parallel Magnetic Resonance Imaging : a structural study by parameterization*
M. Hintermüller, S.L. Keeling and A. Laurain
Technical University of Graz, SFB report no. 23, 2008.

4.6 Others

- 1) - *Where to place a hole ?*
M. Hintermüller and A. Laurain,
ECMI Newsletter 41, march 2007.

5 Talks

5.1 Talks in Conferences

- 2011 - *A shape and topology optimization method for the resolution of inverse problems*
AIP 2011, College Station, Texas, U.S.A., May 2011.
- *Optimal shape design subject to variational inequalities*
SIAM conference on optimization, Darmstadt, Germany, May 2011.
- *A shape and topology optimization method for the resolution of inverse problems*
GAMM 2011, Graz, Austria, April 2011.
- 2010 - *A shape and topology optimization method for the resolution of inverse problems*
Advances in Topological Sensitivity Analysis for Computational Modelling,
LNCC petropolis, Brazil, August 2010.
- *A shape and topology optimization method for the resolution of inverse problems*
Workshop on Optimal Control in Image Processing, Heidelberg, Germany, June 2010.
- 2009 - *Higher-order expansions in Electrical Impedance Tomography*
Workshop p.d.e., optimal design and numerics, Benasque, Spain, August 2009.
- *Higher-order expansions in Electrical Impedance Tomography*
AIP 2009, Vienna, Austria, July 2009.
- *Higher-order expansions in Electrical Impedance Tomography*
SIAM annual meeting, Denver, Colorado, U.S.A. , July 2009.
- 2008 - *Optimal shape design subject to variational inequalities*
OPTPDE (Optimization with PDE constraints), Warsaw, Poland, December 2008.
- *Multiphase image segmentation by shape and topological sensitivity*
Jahrestagung der Deutschen Mathematiker-Vereinigung 2008,
Erlangen, Germany, September 2008.
- *Optimal shape design subject to variational inequalities*
SIAM Conference on Optimization, Boston, Massachusetts, U.S.A., March 2008.
- 2007 - *Optimal shape design subject to variational inequalities*
SIAM Conference on Analysis of Partial Differential Equations
Phoenix, Arizona, U.S.A., December 2007
- *Multiphase image segmentation by shape and topological sensitivity*
ÖMG/JSMF conference 2007
Podbanske, Slovakia, September 2007
- *Optimal shape design subject to variational inequalities*
ENUMATH 2007, University of Graz, Austria, September 2007
- *A TOPSHAPE algorithm for the solution of a state-constrained problem*
First joint international meeting between the AMS and the PTM
University of Warsaw, Poland, August 2007
- *Using Self-adjoint Extensions in Shape Optimization*
IFIP 2007, Krakow, Poland, July 2007
- *A TOPSHAPE Algorithm for obstacle problems*
Cinquième journées singulières,
CIRM, Luminy, France, April 2007
- 2006 - *A Level set method in shape optimization for variational inequations*

- ISMP 2006, Rio de Janeiro, Brazil, August 2006
 - *Numerical methods for shape optimization of variational inequalities*
 Oberwolfach Workshop : Applications of Asymptotic Analysis,
 Mathematisches Forschungsinstitut Oberwolfach, Germany, June 2006
 - *A Level set method in Shape optimization*
 Analytical and numerical methods for scientific computing in science and engineering,
 French-Japanese seminar, University Henri Poincaré, Nancy, France, Februar 2006
- 2005 - *Self-adjoint extensions and topology optimization*
 International meeting Shape optimization and its applications, Nancy, France, October 2005
 - *Level set methods for variational inequalities*
 22nd IFIP TC7 conference, Torino, Italy, July 2005

5.2 Talks in Seminars

- 2011 - *A shape and topology optimization method for the resolution of inverse problems*
 RICAM, Linz, Austria, April 2011
 - *On a Bernoulli problem with geometric constraints*
 University of Clermont-Ferrand, France, January 2011
- 2010 - *A shape and topology optimization method for the resolution of inverse problems*
 University RWTH Aachen, Germany, June 2010
 - *A shape and topology optimization method for the resolution of inverse problems*
 University of Rennes, France, March 2010
 - *A shape and topology optimization method for the resolution of inverse problems*
 University of Avignon, France, Februar 2010
- 2009 - *Image reconstruction in Cartesian parallel MRI*
 SFB status seminar, Admont, Austria, November 2009.
 - *Recent advances in shape optimization*
 University of Besançon, France, April 2009.
- 2008 - *Multiphase image segmentation and modulation recovery in MRI*
 SFB status seminar, Admont, Austria, November 2008.
 - *Electrical Impedance Tomography : From Topology to Shape*
 Institute Elie Cartan, University of Nancy, France, April 2008
 - *Avancées récentes en Optimisation de Formes*
 University of Limoges, France, March 2008
 - *Recent Advances in Shape and Topology Optimization*
 ETH (Eidgenössische Technische Hochschule Zürich),
 Zürich, Switzerland, March 2008
- 2006 - *A Level set method in shape optimization for variational inequations*
 Institute of Applied Mathematics ,
 University of Erlangen, Germany, April 2006
 - *Une méthode "levelset" en optimisation de formes pour des inéquations variationnelles*
 LAMA, University of Savoie, Chambéry, France, April 2006
- 2005 - *Structure des dérivées de forme dans des domaines non-réguliers et applications*
 ENS Cachan, Antenne de Bretagne,
 Campus de Ker-Lann, Bruz, France, March 2005

6 Scientific visits

- 07/2011 **ENS Cachan Bretagne**
Invitation from Dr. Yannick Privat
Rennes, France
- 08/2010 **CMM Santiago**
Invitation from Prof. Carlos Conca
Santiago, Chile
- 08/2010 **LNCC Petropolis**
Invitation from Dr. Antonio André Novotny
Petropolis, Brazil
- 03/2010 **ENS Cachan Bretagne**
Invitation from Dr. Yannick Privat
Rennes, France
- 02/2010 **University of Avignon**
Invitation from Prof. Samuel Amstutz
Avignon, France
- 03/2009 **Humboldt University of Berlin**
Invitation from Prof. Michael Hintermüller
Berlin, Germany
- 07/2008 **University of Sussex**
Invitation from Prof. Michael Hintermüller
Brighton, England
- 04/2008 **Institute Elie Cartan, University of Nancy**
Invitation from Prof. Jan Sokolowski
Nancy, France
- 03/2008 **ETH (Eidgenössische Technische Hochschule Zürich)**
Invitation from Prof. Christoph Schwab
Zürich, Switzerland

7 Organization of scientific events

- 09/2011 **Minisymposium "Modern applications and techniques of shape optimization"**
IFIP TC 7 Conference 2011.
Berlin, Germany.
- 07/2009 **Minisymposium "Recent Advances in Shape and Topology Optimization"**
SIAM 2009 Annual meeting.
Denver, Colorado, U.S.A.
- 09/2008 **Workshop "Advances in Shape and Topology Optimization"¹**
University of Graz, Austria.
Co-organizer of the Workshop with the START Project.
- 09/2007 **ENUMATH 2007²**
University of Graz, Austria.
Co-organizer of the conference.
- 10/2005 **International meeting Shape optimization and its applications**
Institute Elie Cartan, University Henri Poincaré Nancy-1, France.
Co-organizer of the meeting.

8 Scientific courses

- 06/2005 **Special course at the Departement of Mathematics DCAMM**
Topology Optimization-Theory, Methods and Applications
Technical University of Denmark, Lyngby, Denmark
- 11/2004 **Oberwolfach Seminar : Shape Optimization**
Mathematisches Forschungsinstitut Oberwolfach, Germany

9 Reviews

Reviews for Inverse Problems,
SIAM Journal on Scientific Computing (SISC),
SIAM Journal on Control and Optimization (SICON),
Optimization Methods and Software, (OMS)
Computational Optimization and Applications, (COAP).

10 Miscellaneous

Languages French, English and German
IT skills Matlab, Maple, Latex, HTML, CSS

1. <http://math.uni-graz.at/start-workshop08/>
2. <http://www.uni-graz.at/enumath07/>

11 References

Carlos Conca

Centro de Modelamiento Matemático,
Av. Blanco Encalada 2120 Piso 7, Santiago de Chile, Chile,
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Antoine Henrot

Université Henri Poincaré,
BP 239, 54506 Vandœuvre-lès-Nancy Cedex, France,
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Heinrichstr. 36, A-8010 Graz, Austria,
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Avenue Robert Schumann, 35170 Bruz, France.
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V.O., Bol'shoy pr., 61, St.Petersburg, 199178, Russia.
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4, place Jussieu, 75252 Paris, France,
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