Resume

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Present Position

Research Associate Professor, Department of Mechanical, Aeronautical and Nuclear Engineering, Rensselaer Polytechnic Institute.

Professional Experience

- September 1997 - September 1998 : Post-Doctoral Fellow at the École Polytechnique of Montréal in the team of Professeur F. Trochu (Applied Research Center on Polymers).
- September 1998 - September 1999 : Research Associate, École Polytechnique of Montréal.
- September 1999 - June 2002 : Research Associate, Scientific COmputation Research Center, Rensselaer Polytechnic Institute.
- June 2002 - October 2002 : Research Associate Professor, Department of Mechanical, Aeronautical and Nuclear Engineering, Rensselaer Polytechnic Institute.

Education

- September 1987 - June 1992 : Engineering degree, University of Liège, Belgium. Thesis subject : *A finite volume method with flux vector splitting for the resolution of Navier Stokes equations under Boussinesq approximation.*
  Advisor Professor J.-A. Essers.
- June 1997 : Ph.D. in Engineering, University of Liège, Belgium.
  Subject : *Error estimation for electromagnetic fields computation with the finite element method : application to mesh optimization*, *Cumma Sum Laude*. Advisor : Professor W. Legros.

Research Activities

These last three years, our research activities have been focusing on parallel adaptive technologies for the resolution of partial differential equations. We have developped high resolution discontinuous Galerkin schemes for solving non-linear conservation laws. We are presently working on a multi-paradigm design of a scientific computation framework as well as on anisotropic mesh refinement techniques.

Student mentoring

Part of our work is to mentor graduate students on their research projects.

Lilia Krivodonova (Ph.D., Mathematics) : *a posteriori* error estimation and higher order limiters for the Discontinuous Galerkin Method, Graduated July 29th 2002 ;
Xiaojuan Luo (Ph.D., Mechanical Engineering) : curved meshes using Bezier functions ;
Xiagrong Li (Ph.D., Mechanical Engineering) : anisotropic mesh adaptation by means of local mesh modifications, member of the Candidacy Examination Jury, July 20 2002 ;
Peng Hu (Ph.D., Computer Science) : Discontinuous Galerkin Method with high order levelsets and mesh motion ;
Eunyoung Seol (Ph.D., Computer Science) : Optimal Parallel mesh adaptation.

Software realizations

I've been involved in several scientific software projects. Some are now available as open source or as commercial products.

`Gmsh` : `www.geuz.org/gmsh`

`Gmsh` is a sofware project that I started just after having obtained my Ph.D. The aim was to promote the algorithms that I developped during my research (mesh generation and adaptation). I have continued to develop `Gmsh` with C. Geuzaine (Caltech) and the software is now used by a community of more that 200 people, principally in academy.

AOMD : `www.scorec.rpi.edu/AOMD`

In [35] et [36, 11], we have developped, at SCOREC, an original solution for distributed mesh management. We have decided to open the source of AOMD to the community.

LcmFlot : `http ://www.esigroup.com/products/lcmflot/overview.html`

During my stay at the École Polytechnique of Montréal, I've been involved in the development of simulation tools for the modelization of manufacturing processes of high performance composites. This research has lead to a software that is now commercialized by a major commercial software vendor in the field of finite elements (ESI).

Teaching

- Fall 1998 and Winter 1999, École Polytechnique of Montréal, class of MAT105 (Calculus I), 60 hours.
- Winter 1999, École Polytechnique of Montréal, class of IF200 (Data structures and algorithms + `C++` language), 60 hours.
- At RPI, replacement of Pr. M. Shephard (Finite Elements and Computer Science and Engineering classes), for a total of 10 hours.

Miscellaneous

- Pisart Grant, University of Liège, 1988 ;
- NATO Post-Doctoral Fellowship, 1998.
- Member of IEEE, USACM and FABI ;
- Languages : French, English and basis of Dutch ;

Invited Presentations

- J.-F. Remacle, "Parallel Algorithm Oriented Mesh Database", invited by Prof. S. Thomas at the workshop "Adaptive and High-Order Methods with Applications in Turbulence", University of Colorado , Boulder, September 19-21, 2001. Reported to February 11-13, 2002.
- J.-F. Remacle, "Parallel Adaptive Discontinuous Galerkin Method For Solving Conservation Laws", invited by Prof. M. Gobbert, University of Maryland at Baltimore County, March 19, 2001. Available at :
  `http ://www.math.umbc.edu/Math_colloq/s01/colloquium_s01.html`
- J.-F. Remacle and L. Pénet, "Développement d'un logiciel de calcul basé sur les formes différentielles", invited by Prof. M. Fortin, Laval University, Québec, February 07, 1999.
- J.-F. Remacle, "Mailleur automatique de Delaunay ; application l'optimisation des maillages", invited by Prof. R. Camarero, CERCA, Montréal, April 15, 1998. Available at :
  `www.cerca.umontreal.ca/science/seminaires/98.04.15.html`.
- J.-F. Remacle, "Résolution de grands systèmes linéaires par méthodes projectives", invited lecture at the colloquium "Méthodes informatiques de la conception industrielle", École Supérieure d'Ingénérie de Marseille (ESIM), Marseille (France), June 1993.

Contributed Presentations

- Organiser of a mini-symposium at the World Conference on Computational Mechanics, Vienna, July 2002. **Subject :** "Techniques for Automated Adaptive Simulations" ;
- Three oral presentations [47, 48, 49] at the *World conference on computational mechanics*, Vienna, Austria, July 2002 ;

- One oral presentation [36] at the *10th International Meshing Roundtable*, Newport Beach CA, October 07-10, 2001 ;
- Two oral presentations [45, 46] at *USNCCM*, Dearborn MI, July 31 - August 04 2001 ;
- One oral presentation [35] at the *9th International Meshing Roundtable*, New Orleans LA, October 02-05, 2000 ;
- Une oral presentation [44] at the conference *Finite Elements in Flow Problems*, Austin TX, April 30 - May 4, 2000 ;
- Chairman of a technical session and one oral presentation [30] at the *4th International Workshop on Electric and Magnetic Fields*, Marseille (France), 1998.
- One oral presentation [31] at *CADCOMP VI*, Montréal QC, Aug. 01-03, 1998 ;
- One oral presentation [24] and one poster [23] at the *8th Conference on Electromagnetic Field Problems and Applications*, Whuan (China), October 1996 ;
- One oral presentation [22] at the *5th International Conference on Modelling and Simulation of Electric Machines (ELECTRIMACS'96)*, Saint-Nazaire (France), 1996 ;
- One poster at *COMPUMAG*, Berlin, July 1995 ;
- One oral presentation [19] at the conference *Electric and Magnetic Fields : from numerical models to industrial applications*, Leuven (Belgium), 1995 ;
- One oral presentation [16] at the conference *Boundary Elements XV*, Worcester MA (USA), September 1993.

Bibliography

Ph.D. in Engineering

J.-F. Remacle. *Estimation d'erreur dans la modlisation par éléments finis des champs électromagnétiques : Application à l'optimisation de maillages*, *University of Liège*, 1997.

Jury :
- G. Cantraine, University of Liège, President,
- W. Legros, University of Liège, Advisor,
- P. Beckers, University of Liège,
- F.-X. Litt, University of Liège,
- A. Razek, Supélec (France),
- A. Nicolet, University of Aix-Marseille (France).

Publications

Items [1] to [15] are Journal Papers, items [16] to [41] are Conference papers and items [42] to [50] are Abstracts.

[1] A. Nicolet, J.-F. Remacle, B. Meys, A. Genon, and W. Legros. Transformation methods in electromagnetism. *Journal of Applied Physics*, 75(10) :6036–6038, 1994.

[2] J.-F. Remacle, P. Dular, F. Herotte, A. Genon, and W. Legros. Error estimation and mesh optimisation using error in constitutive relation for electromagnetic field computation. *IEEE Transaction on Magnetics*, 31(6) :3587–3589, 1995.

[3] J.F. Remacle H. Hedia, P. Dular, A. Nicolet, A. Genon, and W. Legros. A sinusoidal magnetic field computation in nonlinear materials. *IEEE Transaction on Magnetics*, 31(6) :3527–3529, 1995.

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[5] P. Dular, J.-F. Remacle, F. Henrotte, A. Genon, and W. Legros. Magnetostatic and magnetodynamic mixed formulations compared with conventional formulations. *IEEE Transaction on Magnetics*, 33(2) :1302–1306, 1997.

[6] J.-F. Remacle, P. Dular, F. Henrotte, A. Genon, and W. Legros. On the resolution of magnetostatic and magnetodynamic mixed formulations. *IEEE Transaction on Magnetics*, 33(6) :1768–1772, 1997.

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[8] N. Moës, J. T. Oden, K. Vermaganti, and J.-F. Remacle. Two-scale modeling strategy and a posteriori error estimation for the analysis of representative volume elements (rve). *Computer Methods in Applied Mechanics and Engineering*, 176 :265–278, 1999.

[9] J.E. Flaherty, L. Krivodonova, J.-F. Remacle, and M.S. Shephard. Aspects of discontinuous galerkin methods for hyperbolic conservation laws. *Finite elements in Analysis and Design*, 38 :889–908, 2002.

[10] J.-F. Remacle, J.E. Flaherty, and M.S. Shephard. An adaptive discontinuous galerkin technique with an orthogonal basis applied to compressible flow problems. *SIAM Journal on Scientific Computing*, 2002. in press.

[11] J.-F. Remacle, O. Klaas, J.E. Flaherty, and M.S. Shephard. A parallel algorithm oriented mesh database. *Engineering With Computers*, 2002. in press.

[12] J.-F. Remacle and M. S. Shephard. An algorithm oriented mesh database. *International Journal for Numerical Methods in Engineering*, 2002. in press.

[13] J.-F. Remacle, J.E. Flaherty, and M.S. Shephard. An efficient local time stepping scheme in adaptive transient computations. *Computer Methods in Applied Mechanics and Engineering*, 2002. accepted.

[14] E. Bohr, J.-F. Remacle, and F. Trochu. Numerical simulation of thermal effects in liquid composite moulding. in preparation.

[15] M.K. Gobbert, S.G. Webster, J.-F. Remacle, and T.S. Cale. A spectral galerkin ansatz for the deterministic solution of the boltzmann equation on irregular domains. *SIAM Journal on Scientific Computing*, 2002. submitted.

[16] J.-F. Remacle, A. Nicolet, M. Umé, A. Genon, and W. Legros. Hybrid solver for the fem/bem coupling. In *Boundary Elements XV*, volume 2, pages 505–516. Elsevier Applied Science, 1993.

[17] A. Nicolet, J.-F. Remacle, A. Genon, and W. Legros. Méthodes de transformation et géométrie différentielle en électromagntisme. In *Actes du Colloque Méthodes Informatiques de la Conception Industrielle - Champ Électromagnétique*, pages 125–133, 1993.

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[22] H. Hedia, P. Dular, J.-F. Remacle, W. Legros, and M. Hogge. Mixed formulations applied to thermal problems. In *Proceedings of the 5th International Conference on Modelling and Simulation of Electric Machines (ELECTRIMACS'96)*, volume 1, pages 73–77, 1996.

[23] P. Dular, J.-F. Remacle, B. Meys, A. Genon, and W. Legros. Electric field computation in power line systems using special kind of boundary elements. In *the 8th Conference on Electromagnetic Field Problems and Applications (ICEF)*, Oct. 1996.

[24] J.-F. Remacle, P. Dular, C. Geuzaine, A. Genon, and W. Legros. Adaptive hp-refinement for finite element computations using nodal and edge elements. In *the 8th Conference on Electromagnetic Field Problems and Applications (ICEF)*, Oct. 1996.

[25] B. Meys, J.-F. Remacle, F. Robert, P. Dular, and W. Legros. Analyse de la résonance d'une cavité 3d dissipative par la méthode des éléments finis. In *Actes des Quatrièmes Journes de Caractérisation Microonde et Matriaux JCMM'96*, pages 201–204, 1996.

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[27] P. Dular, F. Robert, J.-F. Remacle, W. Legros M. Umé, and U. Pahner. Computation of the source current density in inductors of any shape using a mixed formulation. In *Proceedings of the International Workshop on Electric and Magnetic Fields, EMF'96*, volume 10 : Nonlinear Electromagnetic Systems, pages 107–112, 1996.

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[30] J.-F. Remacle, C. Geuzaine, F. Deliège, P.Dular, B. Meys, and W. Legros. Error convergence of some classical higher order curl conforming finite elements. In *4th International Workshop on Electric and Magnetic Fields*, volume 2, pages 373–378, 1998.

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[50] Shephard M.S., Luo X., Remacle J.-F., O'Bara R.M., and Beall M.W. Meshing for p-version finite element methods. In *World Congress in Computational Mechanics*, 2002.