

Jan Van lent

Personal Details

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Date of Birth: 15/07/1976 Nationality: Belgian

Current Position

Research Officer at the University of Bath: Postdoc in the Numerical Analysis theme of the Bath Institute of Complex Systems (BICS), which is part of the Department of Mathematical Sciences at the University of Bath

Since 01/03/2006, end of contract 31/05/2009

Higher Education

2000–2006 Ph.D. in Applied Sciences, Katholieke Universiteit Leuven, Leuven, Belgium
Thesis Multi-Level Iterative Methods for Time-Dependent Partial Differential Equations

1999–2000 M.Sc. in Machine Learning and Adaptive Computing,
University of the West of England, Bristol, UK (with distinction)

Thesis Modelling Two-Dimensional Sorting in Worker Ants

1994–1999 Burgerlijk Ingenieur in de Computerwetenschappen, optie toegepaste wiskunde
(Engineer in Computer Science, option applied mathematics, a 5-year programme),
Katholieke Universiteit Leuven, Leuven, Belgium (magna cum laude)

Thesis Multigrid Methods for Solving Time-Dependent Partial Differential Equations on
Space-Time Grids

Research Interests

- Adaptive and moving mesh methods
- Applications of optimal transport problems
- Numerical solution of Monge-Ampère and Monge-Kantorovich problems
- Iterative methods for problems with multiple scales
- Robust domain decomposition methods for problems with variable coefficients
- Multigrid methods for time-dependent partial differential equations
- Finite difference, finite element and spectral methods
- High order time discretisation schemes for ODEs
- Delay and functional differential equations
- Functional calculi and spectral mapping theorems
- Models of computing, programming languages and paradigms

Experience

Implemented methods for solving Monge-Kantorovich linear programming problems.

Implemented methods for solving Monge-Ampère equations.

Collaborated with Dr. Paul Godden (ICR) on the implementation of models for ultrasound therapy.

Organised the Numerical Analysis seminars of the Department of Mathematical Sciences of the University of Bath.

Developed two-level overlapping Schwarz methods.

Developed code for modelling photonic crystals.

Developed multigrid solvers in C, C++, Fortran and Python.

Developed convergence analysis software in Matlab as well as a combination of Python with ZPL and Fortran.

Attended the European Study Group with Industry (ESGI 68) in Southampton (01/04/2009).

Attended Workshop 2 of the HPC/NA Roadmapping Activity at Manchester University (08/12-2008–09/12/2008).

Attended the European Study Group with Industry (ESGI 56) in Bath (03/04/2006 – 07/04/2006).

Visited Prof. Francesca Mazzia at the University of Bari, Italy (15/3/2004–9/4/2004). Integrated a multigrid method in the ODE solver GAMD developed by Prof. Mazzia.

Wrote a Matlab interface for the SAMG solver by Klaus Stüben.

Worked on a project simulating storage conditions of harvested fruit.

Worked on modelling and simulating organisation in ant colonies.

Followed doctoral courses on multigrid (Joppich), adaptive methods (Süli), convex optimisation (Vandenberghe), computational differential equations (Budd, Dahmen, DeVore, Sapiro), optimal control (Van Impe), numerical problem solving (Laurie), preconditioning (Wathen), algebraic multilevel methods (Notay), homogenisation (Kamotski), nonlinear analysis and calculus in Banach spaces (Toland).

Skills

Operating Systems Linux, Unix, Mac OS X, Windows

Programming Languages

- extensive use for academic research: Python, Matlab, C/C++, Fortran, Maxima
- good knowledge: Java, Scheme, Common Lisp, OCaml, R

Numerical Libraries and applications Numpy, Scipy, CVXOPT, Pyx, Matplotlib, Lapack, SAMG, Femlab, LFA, SuperLU, UMFPack

Parallel Programming MPI, ZPL

Revision Control Systems Darcs, Git, SVN, CVS

Languages Dutch (native), English (fluent), French (fluent), German (basic), Spanish (reading), Italian (reading)

Teaching

2001–2006 Teaching Assistant Numerical Linear Algebra, Leuven

2006–2007 Tutor for MA20010 Vector Calculus and Partial Differential Equations, Bath

2007 Tutor for MA20014 Numerical Analysis, Bath

Nov 2007 Guest Lecturer in the Scientific Computing course of Prof. Eero Vainikko at the University of Tartu, Estonia

2008 Lecturer for MA50177 Scientific Computing, Bath

2008-2009 Tutor for MA20010 Vector Calculus and Partial Differential Equations, Bath

Interested in teaching subjects in mathematics, computer science, science, engineering

Co-Supervision of Master Students

2001 Pieter De Ceuninck, Numerical simulation of the dynamics of space-plasmas

2002 Jeroen Christiaens, Multigrid methods for finite element discretisations of time-dependent partial differential equations

2003 Ingrid Joossens, Numerical simulation with neural networks

2004 Hendrik Speleers, Numerical simulation with Powell-Sabin splines

2005 Freek van de Griendt, A time-parallel time integration method

2006 Peter Way, Numerical solution of coupled carrier diffusion and wave propagation in laser models

2006 Sean Buckeridge, Numerical simulation of microstructures (MSc),
Multigrid methods for numerical weather prediction (PhD)

2007 Jeremy Campbell, Modelling the injection of CO₂ into deep saline aquifers

Refereeing

- SIAM Journal on Scientific Computing (SISC)
- Journal of Computational and Applied Mathematics (JCAM)
- International Conference of Numerical Analysis and Applied Mathematics (ICNAAM)
- Numerical Methods for Partial Differential Equations
- International Journal of Computer Mathematics

Publications

- A. Sendova-Franks, and J. Van lent, Random walk models of worker sorting in ant colonies, *Journal of Theoretical Biology* 217 (2), pp. 255–274, July, 2002
- J. Van lent, and S. Vandewalle, Multigrid waveform relaxation for anisotropic partial differential equations, *Numer. Algorithms* 31 (1–4), pp. 361–380, December, 2002
- J. Van lent, and S. Vandewalle, Multigrid methods for implicit Runge-Kutta and boundary value method discretizations of parabolic PDEs, *SIAM J. Sci. Comput.* 27 (1), pp. 67–92, August, 2005
- J. Van lent, J. Janssen, and S. Vandewalle, Multigrid waveform relaxation for delay partial differential equations, *Time-delay systems 2004* (Michiels, W. and Roose, D., eds.), IFAC Proceedings Volumes, pp. 203–208, 2005
- J. Van lent, D. Smits, S. Vandewalle, N. Scheerlinck, and B. Nicolaï, Experiences with an algebraic multigrid method for a 3D biological respiration-diffusion model, *International Compumag Society (ICS) Newsletter* 12 (1), pp. 9–14, March, 2005
- J. Van lent, and S. Vandewalle, Waveform relaxation using spectral collocation in time, *ICNAAM 2005 - International Conference on Numerical Analysis and Applied Mathematics 2005* (Simos, T.E. and Psihoyios, G. and Tsitouras, Ch., eds.), pp. 850–853, 2005
- D. Allwright, K. Briggs, P. Dellar, J. Gravesen, R. Scheichl, J. Van lent, and M. Zyskin, Sensitivity of Markov chains for wireless protocols, *Study Group Report, 56th European Study Group with Industry*, Bath, 2006.
- T. Boonen, J. Van lent, H. De Gerssem, J. Driesen, and S. Vandewalle, Algebraic multigrid for implicit Runge-Kutta discretizations of the eddy current problem, *IEEE Trans. Magn.* 43 (4), pp. 1265–1268, April, 2007
- T. Boonen, J. Van lent, and S. Vandewalle, Local fourier analysis of multigrid for the curl-curl equation, *SIAM J. Sci. Comput.* 30 (4), pp. 1730–1755, April, 2008
- T. Boonen, J. Van lent, and S. Vandewalle, An algebraic multigrid method for high order time-discretization of the div-grad and the curl-curl equations, *Applied Numerical Mathematics* 59 (3–4), pp. 507–521, March, 2009
- J. Van lent, R. Scheichl, and I.G. Graham, Energy Minimizing Coarse Spaces for Two-level Schwarz Methods for Multiscale PDEs, *Numerical Linear Algebra with Applications*, March, 2009, doi 10.1002/nla.641

Conference Presentations

Multigrid waveform relaxation for anisotropic partial differential equations, Auckland Numerical Ordinary Differential Equations, ANODE, Auckland, New Zealand, January 8–12, 2001

Multigrid waveform relaxation for anisotropic partial differential equations, Copper Mountain Conference on Multigrid Methods, CMCMM, Copper Mountain, CO, US, April 1–6, 2001

Multigrid Waveform Relaxation with Runge-Kutta and BVM Time-discretisation, International Conference on Scientific Computation and Differential Equations, SciCADE01, Vancouver, Canada, July 28–August 3, 2001

Multigrid for high order time discretisation of parabolic equations, Tenth International Congress on Computational and Applied Mathematics, ICCAM2002, Leuven, Belgium, July 22–26, 2002

Multigrid for high order time discretisation of parabolic equations, Seventh European Multigrid Conference, EMG02, Pforzheim-Hohenwart, Germany, October 7–10, 2002

Multigrid methods for implicit Runge-Kutta and boundary value method discretizations of parabolic PDEs, International Workshop on the Technological Aspects of Mathematics - II, IWTAM2, Montecatini Terme (Pistoia), Italy, April 1–3, 2004

Waveform relaxation with spectral collocation in time, Eleventh International Congress on Computational and Applied Mathematics, ICCAM2004, Leuven, Belgium, July 26–30, 2004

Multigrid waveform relaxation for delay partial differential equations, Fifth IFAC International Workshop on Time Delay Systems, TDS04, Leuven, Belgium, September 8–10, 2004

Waveform relaxation using spectral collocation in time, International Conference on Numerical Analysis and Applied Mathematics, ICNAAM 2005, Rhodes, Greece, 16–20 September, 2005

Multigrid for Time-Dependent PDEs, BATH/RAL Numerical Analysis Day, Bath, UK, 18 September, 2006

Robust Coarsening for Domain Decomposition Methods, Copper Mountain Conference on Multigrid Methods, CMCMM, Copper Mountain, CO, US, 23 March, 2007

Robust Coarsening for Domain Decomposition Methods, 22nd Biennial Conference on Numerical Analysis, NA07, Dundee, UK, 26 June, 2007

Constructing Robust Coarse Spaces for Overlapping Schwarz Methods, BICS Conference on Numerical Analysis: Multiscale Methods Adaptivity & Complexity, NAMMAC07, Bath, UK, 5 September, 2007

Robust Domain Decomposition Methods, BICS Meeting: The Maths of Complex Systems, Bath, UK, 6 February 2008