Curriculum Vitae

Mark van Hoeij

GENERAL INFORMATION

University Address: Department of Mathematics
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Professional Preparation

11/1992 – 11/1996   *Doctoral degree, University of Nijmegen, Netherlands.* Major: *Mathematics.*
Dissertation: *Factorization of Linear Differential Operators.*
Dissertation supervisor: *Prof. A.H.M. Levelt.*

08/1987 – 11/1992   *Master's degree, University of Nijmegen, Netherlands.* Major: *Mathematics.*
Thesis: *Berekening van de ring van gehelen in een algebraïsch functielichaam.*
Thesis supervisor: *Prof. A.H.M. Levelt.*

Sabbatical Study (or equivalent post-doctoral education)

05/2004 – 12/2004   Sabbatical, University of Kassel, Germany.

08/1998 – 12/1998   Postdoc, Mathematical Sciences Research Institute, Berkeley, CA.

Professional Experience

08/2008 – present   Professor, Department of Mathematics, College of Arts and Sciences.
Florida State University.

08/2002 – 08/2008   Associate Professor, Department of Mathematics, College of Arts and Sciences.
Florida State University.

08/1997 – 07/2002   Assistant Professor, Department of Mathematics, College of Arts and Sciences.
Florida State University.

Visiting Professorship

06/2001 – 06/2001   Professeur Invité, University of Limoges, France.

Honors and Awards

Research Fellowship Award, Alexander von Humboldt Foundation (for sabbatical) (2004).

Elected Secretary of ACM/SIGSAM (2003–2006).

Bronze medal, International Mathematics Olympiad (1987).

Membership in Professional Organizations

ACM/SIGSAM (the ACM Special Interest Group in Symbolic and Algebraic Manipulation).

TEACHING

Courses Taught

Linear algebra, MAS 3105.

Computer algebra, MAS 5731.

Discrete Mathematics, MAD 2104.

Calculus I, MAC 2311.

Calculus II, MAC 2312.

Putnam Course, MAT 4930.

Groups, Rings, Vector Spaces I, MAT 5307.

Groups Rings and Vector Spaces II, MAT 5308.

Introduction to Advanced Mathematics, MGF 3301.

Algebraic Number Theory, MAS 5331.

Introduction to Abstract Algebra I, MAS 4302.

Introduction to Abstract Algebra II, MAS 4303.

Modern Algebra, MAS 3301.

Introduction to Analysis, MAA 4224.

Theory of Numbers, MAS 4203.

New Course Development

1. Computer algebra, MAS 5731 (two separate courses, listed under the same name).

2. Algebraic Number Theory, MAS 5331.

Chair of Doctoral Dissertation Supervisory Committees

1. Andrew Novocin, FSU, thesis defended in April 2008, now a postdoc in Lyon, France.

2. Giles Levy, FSU, thesis defended in December 2009.

3. Yong Jae Cha, FSU, thesis defended in December 2010, now a postdoc at RISC-Linz, Austria.

4. Quan Yuan, FSU.

5. Tingting Fang, FSU.

6. Vijay Kunwar, FSU.

Member of Doctoral Dissertation Supervisory Committees

1. Douglas Xiaozhong Liao. (FSU, November 1997).

2. Anne Fredet (University of Limoges, France, November 2001).

3. Thomas Cluzeau (University of Limoges, France, October 2004).

4. Maint Berkenbosch (University of Groningen, Netherlands, October 2004).

5. Goce Jakimoski (FSU, January 2005).

6. Yuri Lebedev (FSU, November 2008).

Member of Master's Thesis Supervisory Committees

1. Stephen Chun-To Tse (Simon Fraser University, Vancouver, July 2002).

2. Ruben Debeerst (University of Kassel, Germany, October 2007).

SCHOLARLY OR CREATIVE ACTIVITIES

Refereed Journal Articles Published

1. M. van Hoeij. An appendix in the paper: *The Complete Generating Function for Gessel Walks is Algebraic*, by A. Bostan and M. Kauers, Proc. Amer. Math. Soc. 138 (2010), pp. 3063-3078.

2. M. van Hoeij, J. Cremona, *Solving conics over function fields*, Journal de Theorie des Nombres de Bordeaux, **18**, 595-606 (2006).

3. S. Abramov, M. Barkatou, M. van Hoeij, *Apparent Singularities of Linear Difference Equations with Polynomial Coefficients*, AAECC, **17**, 117-133 (2006).

4. T. Cluzeau, M. van Hoeij, *Computing Hypergeometric Solutions of Linear Recurrence Equations*, AAECC, **17**, 83-115 (2006).

5. M. van Hoeij, M. van der Put, *Descent for differential modules and skew fields.* Journal of Algebra, **296**, 18-55 (2006).

6. T. Cluzeau, M. van Hoeij *A Modular Algorithm to Compute the Exponential Solutions of a Linear Differential Operator*, J. Symb. Comput., 38, 1043-1076 (2004).

7. B. Deconinck, M. Heil, A. Bobenko, M. van Hoeij, M. Schmies. *Computing Riemann Theta Functions*, Math. Comp. **73**, 1417-1442, (2004).

8. S. Abramov, M. van Hoeij, *Set of Poles of Solutions of Linear Difference Equations with Polynomial Coefficients.* Computational Mathematics and Mathematical Physics, Vol. 43, No. 1, 57-62, (2003).

9. M. van Hoeij, *Decomposing a 4'th order linear differential equation as a symmetric product*, Banach Center Publications, **58**, 89-96, (2002).

10. M. van Hoeij, *Factoring polynomials and the knapsack problem*, J. of Number Theory, 95, 167-189, (2002).

11. B. Deconinck, M. van Hoeij, *Computing Riemann matrices of algebraic curves.* PhysicaD, 152, 28-46 (2001).

12. S.A. Abramov, M. van Hoeij, *Integration of solutions of linear functional equations.* Integral Transforms and Special Functions, Vol.8, No 1-2, pp. 3-12. (1999).

13. M. van Hoeij, *Finite Singularities and Hypergeometric Solutions of Linear Recurrence Equations*, J. Pure Appl. Algebra, 139, 109-131 (1999).

14. M. van Hoeij, J.F. Ragot, F. Ulmer and J.A. Weil, *Liouvillian solutions of linear differential equations of order three and higher.* J. Symb. Comput., 28, 589-609 (1999).

15. M. van Hoeij, J-A. Weil, *An algorithm for computing invariants of differential Galois groups.* J. Pure Appl. Algebra, 117&118, 353-379 (1997).

16. M. van Hoeij, *Factorization of Differential Operators with Rational Functions Coefficients*, J. Symb. Comput., 24, 537-561 (1997).

17. M. van Hoeij, *Formal Solutions and Factorization of Differential Operators with Power Series Coefficients.* J. Symb. Comput., 24, 1-30 (1997).

18. M. van Hoeij, *Rational Parametrizations of Algebraic Curves using a Canonical Divisor.* J. Symb. Comput., 23, 209-227 (1997).

19. M. van Hoeij, *An algorithm for computing an integral basis in an algebraic function field*, J. Symb. Comput., 18, 353-363 (1994).

Non-Refereed Publications Completed

1. Slides of recent conference presentations can be copied from http://www.math.fsu.edu/~hoeij/papers.html

2. W. N. Everitt, D. J. Smith, and M. van Hoeij, *The Fourth-Order Type Linear Ordinary Differential Equations*, http://www.arxiv.org/abs/math.CA/0603516 (2006).

3. M. van Hoeij, B. de Medeiros, and S. Wetzel, *On Random-Code Based Secret Locking Schemes*, http://www.cs.fsu.edu/~breno/white-vector.pdf (2006).

4. M. van Hoeij, *A conjecture in the problem of rational definite summation*, http://arxiv.org/abs/math.CO/0210158 (2002).

5. M. van Hoeij, *An algorithm for computing the Weierstrass normal form of hyperelliptic curves*, http://arxiv.org/abs/math.AG/0203130 (2002).

Refereed Papers Presented at Conferences and Symposia

1. M. van Hoeij and G. Levy. *Liouvillian Solutions of Irreducible Second Order Linear Difference Equations, joint work with Giles Levy*, ISSAC'2010 Proceedings, p. 297-302.

2. Y. Cha, M. van Hoeij and G. Levy. *Solving Recurrence Relations using Local Invariants*, ISSAC'2010 Proceedings, p. 303-310.

3. M. van Hoeij and Q. Yuan. *Finding all Bessel type solutions for Linear Differential Equations with Rational Function Coefficients*, ISSAC'2010 Proceedings, p 37-44, (2010).

4. M. van Hoeij and A. Novocin, *Gradual sub-lattice reduction and a new complexity for factoring polynomials*, LATIN'2010: p. 539-553, (2010).

5. Y. Cha and M. van Hoeij, *Liouvillian Solutions of Irreducible Linear Difference Equations*, ISSAC'2009 Proceedings, p. 87-93, (won an award for best student co-authored paper) (2009).

6. R. Debeerst, M. van Hoeij, W. Koepf, *Solving Differential Equations in Terms of Bessel Functions*, ISSAC'08 Proceedings, 39-46, (2008).

7. A. Galligo and M. van Hoeij, *Approximate Bivariate Factorization, a Geometric Viewpoint*, SNC'07 Proceedings, 1-10 (2007).

8. M. van Hoeij, *Solving Third Order Linear Differential Equations in Terms of Second Order Equations*, ISSAC'07 Proceedings, 355-360, (2007).

9. M. van Hoeij, J-A. Weil, *Solving Second Order Linear Differential Equations with Klein's Theorem.* ISSAC'05 Proceedings, 340-347, (2005)

10. R. Burger, G. Labahn, M. van Hoeij, *Closed form solutions of linear odes having doubly periodic coefficients.* ISSAC'04 Proceedings, 58-64, (2004).

11. M. van Hoeij, M. Monagan, *Algorithms for Polynomial GCD Computation over Algebraic Function Fields.* ISSAC'04 Proceedings, 297-304, (2004).

12. M. van Hoeij, M. Monagan, *A Modular GCD algorithm over Number Fields presented with Multiple Extensions*, ISSAC'02 Proceedings, (2002).

13. M. van Hoeij, *Factoring Polynomials and 0-1 Vectors.* CaLC'2001 proceedings, Lect. Notes in Comp. Science, 2146, p. 45-50, (2001).

14. R. M. Corless, M. W. Giesbrecht, M. van Hoeij, I. S. Kotsireas, S. M. Watt, *Towards Efficient Factorization of Bivariate Approximate Polynomials*, ISSAC'01 proceedings. 85-92 (2001).

15. S.A. Abramov, M. van Hoeij, *Desingularization of linear difference operators with polynomial coefficients*, ISSAC '99 Proceedings, 269-275 (1999).

16. M. van Hoeij, *Rational Solutions of Linear Difference Equations.* ISSAC'98 proceedings. 120-123 (1998).

17. S. A. Abramov, M. van Hoeij, *A method for the Integration of Solutions of Ore Equations* ISSAC '97 Proceedings, 172-175 (1997).

18. M. van Hoeij, *Rational Solutions of the Mixed Differential Equation and its Application to Factorization of Differential Operators*, ISSAC '96 Proceedings, 219-225 (1996).

19. M. van Hoeij, *An algorithm for computing the Weierstrass normal form*, ISSAC '95 Proceedings, 90-95 (1995).

20. M. van Hoeij, *Computing parametrizations of rational algebraic curves*, ISSAC '94 Proceedings, 187-190 (1994).

Invited Keynote and Plenary Presentations

1. Mark van Hoeij (2010, May). East Coast Computer Algebra Day 2010, Atlanta GA.

2. Mark van Hoeij (2007, December). *The complexity of factoring univariate polynomials over the rationals*, MACIS 2007, in Paris France.

3. Mark van Hoeij (2007, July). *The complexity of factoring univariate polynomials over the rationals.* Plenary presentation at Journeés Arithmétiques (http://www.ja2007.org). Edinburgh, UK.

4. Mark van Hoeij (2006, July). *Factorization and hypergeometric solutions of linear recurrence systems.* Conference in memory of Manuel Bronstein. Nice, France.

5. Mark van Hoeij (2001, March). *Factoring Polynomials by Computing 0-1-Vectors with Lattice Reduction.* Plenary presentation at CaLC (conference on cryptography and lattices) Brown University, Providence, Rhode Island.

Note: Journeés Arithmétiques is the largest and most prestigious number theory conference, invited speakers included the most famous number theorists and a Fields medalist.

Invited Presentations or Symposia (conference paying expenses)

Only invitations are listed here where the conference pays for the travel/local expenses of the invited speaker.

1. Mark van Hoeij (2010, January). Macaulay2 workshop in Berkeley, CA.

2. Mark van Hoeij (2009, April). NSF workshop. Future directions of symbolic computation research and its applications to the domain sciences.

3. Mark van Hoeij (2009, March). Limoges, France. Invited talk at workshop Calcul algébrique et équations différentielles.

4. Mark van Hoeij (2008, March). Limoges, France.

5. Mark van Hoeij (2007, April). Groningen, Netherlands. Conference for the retirement of M. van der Put.

6. Mark van Hoeij (2007, April). Newark, NJ., Second Int. Workshop on Differential Algebra and Related Topics.

7. Mark van Hoeij (2006, September). Minnesota. IMA workshop Algorithms in Algebraic Geometry.

8. Mark van Hoeij (2006, May). Palo Alto, CA. ARCC workshop on polynomial factorization.

9. Mark van Hoeij (2005, October). Banff, Canada. BIRS Workshop Challenges in Linear and Polynomial Algebra in Symbolic Computation Software.

10. Mark van Hoeij (2005, July). Munich, Germany. International Conference on Difference Equations, Special Functions and Applications.

11. Mark van Hoeij (2005, July). Oberwolfach, Germany. Explicit Methods in Number Theory.

12. Mark van Hoeij (2005, June). Kassel, Germany. Computeralgebra Tagung 2005.

13. Mark van Hoeij (2004, December). Institut Henri Poincaré, Paris, France. Workshop Explicit Arithmetic Geometry.

14. Mark van Hoeij (2004, October). Groningen, Netherlands. Number theory seminar.

15. Mark van Hoeij (2004, March). CIRM, France. Groupes de Galois arithmetiques et differentiels.

16. Mark van Hoeij (2002, December). Kolchin Seminar on Differential Algebra in New York.

17. Mark van Hoeij (2002, July). Simon Fraser University in Vancouver (colloquiem talk).

18. Mark van Hoeij (2002, July). Arithmetic and Differential Galois Groups, Oberwolfach, Germany.

19. Mark van Hoeij (2002, July). University of Kassel, Germany (colloquiem talk).

20. Mark van Hoeij (2002, June). ORCCA research chair in Waterloo and London, Ontario.

21. Mark van Hoeij (2001, November). Colorado State University (colloquiem talk).

22. Mark van Hoeij (2001, July). ORCCA research chair, University of Waterloo, Ontario.

23. Mark van Hoeij (2001, June). University of Eindhoven, Netherlands (colloquiem talk).

24. Mark van Hoeij (2001, June). University of Rennes, France (colloquiem talk).

25. Mark van Hoeij (2001, April). NMC (the annual math conference in the Netherlands).

26. Mark van Hoeij (2000, November). Workshop on Differential Algebra in Newark, NJ.

27. Mark van Hoeij (2000, May). University of Waterloo, Ontario (colloquiem talk).

28. Mark van Hoeij (prior to 2000). One invitation in 1999, two in 1998, five in 1997, and six international invitations prior to 1997 as a graduate student.

Invited Presentations or Symposia (other)

These are presentations where the conference invites speakers without offering to reimburse their expenses. I am not sure if that counts as an invited talk.

1. Mark van Hoeij (2006, January). San Antonio. AMS meeting, Session on Field Extensions and Algorithms.

2. Mark van Hoeij and Andrew Novocin. (2003, July). ACA'2003 conference in Raleigh, NC.

3. Mark van Hoeij (2001, January). AMS Special Session speaker in New Orleans.

4. Mark van Hoeij (2000, October). AMS Special Session speaker in San Francisco.

Contracts and Grants

Contracts and Grants Funded

1. M. van Hoeij, *Solving Linear Differential Equations in terms of Special Functions*, $396K (2010–2013)

2. M. van Hoeij, *Closed Form Solutions for Linear Differential and Difference Equations*, NSF grant 0728853, $275K, (2007–2010).

3. S. Gao, M. van Hoeij, E. Kaltofen, and V. Shoup, *The computational complexity of polynomial factorization* Workshop at American Institute of Mathematics, Palo Alto, California. This award paid for the travel and local expenses of 32 people we invited to the workshop. (2006).

4. M. van Hoeij, *Simplifying Algebraic Numbers and Algebraic Functions*, NSF grant 0511544, $90K, (2005).

5. M. van Hoeij, *Simplifying Expressions in Computer Algebra*, FSU grant CRC/COFRS, $8K, (2005).

6. M. van Hoeij, *Special function solutions of differential equations*, Research Fellowship from the Alexander von Humboldt Foundation (for sabbatical expenses in Germany) (2004).

7. M. van Hoeij, *Algorithms for Linear Differential Equations and Algebraic Functions*, NSF grant 0098034, $152K, (2001–2004).

8. M. van Hoeij, *East Coast Computer Algebra Day 2001*, NSF grant 0112495, $9K, (2001).

9. M. van Hoeij, *Algorithms for Solving Linear Recurrence Equations*, NSF grant 9805983, $42K, (1998–2000).

10. M. van Hoeij, *First Year Assistant Professor*, FSU grant CRC/FYAP 132859548, $10K, (1998).

<u>Contracts and Grants Denied</u>

1. M. van Hoeij, *Solving Linear Recurrence Relations.* Submitted to NSF on 05/24/2006.

2. B. de Medeiros, M. van Hoeij, and S. Wetzel, *CT-ER: Collaborative Research: Secret Locking - Exploring a New Approach to Biometric Key Encapsulation.* Submitted to NSF on 03/06/2006.

3. B. de Medeiros, M. van Hoeij, and S. Wetzel, *CT-T: Secret Locking: A New Approach to Biometric Key Encapsulation.* Submitted to NSF on 02/07/2005.

4. M. van Hoeij, *Solving Linear Differential Equations in terms of Special Functions.* Submitted to NSF on 03/04/2004.

5. M. van Hoeij, *Factoring Polynomials with Exact or Approximate Coefficients.* Submitted to NSF on 12/14/2000.

6. M. Seppala, M. van Hoeij, E. Hironaka, E. Klassen, P. Aluffi, *Geometry Renaissance at Florida State University.* Submitted to NSF on 12/01/1999.

Service

Department of Mathematics I am currently director of pure mathematics.

1. Committee Chairperson, Student Societies Committee (the Putnam exam) (2000–2010, except during my sabbatical in Fall 2004).

2. Committee Member, Doctoral Preliminary Examination Committee

3. Committee Member, Faculty Recruitment Committee (2001–2003 and 2006–2007).

4. Committee Member, Curriculum Committee (2003).

5. Committee Member, Symbolic Computation Committee (1998–2001).

6. Committee Member, Pure Mathematics Doctoral Preliminary Examination Committee (2001).

7. Committee Member, Graduate Student Recruitment Committee, (1998–2000).

8. Committee Member, Financial Aid Committee (1999).

The Profession

Guest Reviewer for Refereed Journals

I review six to eight journal papers each year, mostly for

1. Journal of Symbolic Computation

2. Applicable Algebra in Engineering Communication and Computing

3. Journal of Mathematical Analysis and Applications

4. Theoretical Computer Science

5. Journal of Algebra and Its Applications

This list is not complete, I omitted journals that I reviewed only one paper for. I also review about six conference papers each year, in particular for the ISSAC conference mentioned below.

Service to the Community

Note: ISSAC and MEGA are the two largest conferences on symbolic computation.

1. Member of the program committee for the ISSAC (International Symposium on Symbolic and Algebraic Computation) conferences in 1999, 2001, 2002, 2006, and 2008.

2. Member of the advisory board and program committee for MEGA'2003 and MEGA'2005 (Effective Methods in Algebraic Geometry)

3. Elected Secretary of ACM/SIGSAM (the ACM Special Interest Group in Symbolic and Algebraic Manipulation) (2003–2006).

4. Co-organizer workshop on Polynomial Factorization, AIM (American Institute of Mathematics). Palo Alto, May 15–19, 2006.
   Obtained funding for the travel and local expenses of the participants.

5. Sole organizer of ECCAD'01, the East Coast Computer Algebra Day, held at Florida State University on May 5, 2001.
   Obtained funding from the NSF for the travel and local expenses of the participants.

6. I develop algorithms and software used by hundreds of researchers worldwide. I believe that this is a valuable contribution to our scientific community.

Software

The following software is freely available through the web or e-mail, including source code. Much of this was written under the support of NSF grants.

1. Developed a new algorithm for computing hypergeometric solutions of difference equations that can handle much harder equations by avoiding splitting fields.

2. Solved the combinatorial problem that occurs for factoring polynomials with rational coefficients, which resulted in a much improved algorithm that has been adopted by computer algebra packages such as Maple, NTL, Pari, MuPAD, and Magma.

3. An algorithm for evaluating Riemann Theta functions (joint work).

4. Wrote the diffop package in Maple, which includes: DFactor (factorizer for differential operators), exponential solutions, formal solutions and generalized exponents, endomorphism ring, and many other tools for solving linear differential equations.

5. Liouvillian solutions for second and third order differential equations.

6. Several methods to reduce differential equations to second order equations.

7. Integration algorithm for solutions of differential equations.

8. Solving conics over $\mathbb{Q}(t_1, \ldots, t_k)$.

9. Maple's algebraic curves package.