Resume

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POSITIONS

1993 – Present Full Professor of Computer Science, Courant Institute, New York University

1986 – 1993 Associate Professor of Computer Science, Courant Institute, New York University

1984 – 1988 Associate Professor of Computer Science, Rutgers University

1979 – 1984 Assistant Professor of Computer Science, Rutgers University

1977 – 1979 Adjunct Lecturer of Computer Science, Rutgers University

1995 (Summer) Summer Faculty, BRICS Center, Univeristy of Aarhus, Denmark

1993 – 1994 Visiting Professor, Datalogisk Institut, University of Copenhagen

1992 – 1993 Visiting Research Scientist, Computer Sciences Department, Purdue University

1990 – 1991 Visiting Associate Professor of Computer Science, University of Wisconsin-Madison

1985,1986,1988 (Summers) Summer Faculty, IBM Yorktown Heights

1983 (Summer, Fall) Visiting Assistant Professor of Computer Science, Yale University

1982 (Spring, Summer) Visiting Scholar in Computer Science, Stanford University

1980 (Summer) Visiting Assistant Professor of Computer Science, University of Rochester

EDUCATION

1979 Ph. D., Computer Science, Courant Insitute, New York University, Dissertation: "Expression Continuity and the Formal Differentiation of Algorithms," Adviser: J. T. Schwartz.

1973 M. S., Computer Science, Courant Institute, New York University.

1968 B. A., Chemistry, Occidental College, Los Angeles, CA.

Honors

1995 BRICS VIP, 4 Invited Lectures, "Analysis and Transformation of Set-Theoretic Languages," BRICS, U. of Aarhus, Denmark, Aug. 1995.

1995 Invited speaker at Symp. Celebrating the Scientific Trajectory of Jack Schwartz, New York City, May 1995.

1994 Invited speaker for Joint 6th Intl. Conf. on Programming Language Implementation and Logic Programming (PLILP) and 4th Intl. Conf. on Algebraic and Logic Programming (ALP), Sept., 1994, Madrid, Spain.

1990 Honorary Fellow, WARF Foundation Award at University of Wisconsin.

1990 Invited speaker for ESOP '90, May, 1990, Copenhagen, Denmark.

1981 Dissertation selected for publication as a book in UMI Research Press outstanding Computer Science dissertation series.

Grant Support As Principal Investigator

1998 – 1999 Office of Naval Research N00014-99-1-0131, "Transformational Development of Reactive Systems," $72,150.

1997 – 1998 National Science Foundation, Supplement to National Science Foundation Grant CCR-9616993, $50,000.

1996 – 1997 Office of Naval Research N00014-97-1-0128, "Improving Productivity of Algorithm and System Implementation in Scaled Up Applications," $76,000.

1996 – 1997 National Science Foundation CCR-9616993, "Improving Productivity of Algorithm and System Implementation in Scaled Up Applications," $50,000.

1996 Office of Naval Research, Supplement to Office of Naval Research Grant N00014-93-1-0924, $30,000.

1994 – 1996 Joint NSF/ESPRIT travel grant for 7 US universities and 7 European universities in Semantics Based Program Manipulation - NSF Grant Number CCR-9221774, Carolyn Talcott main US PI at Stanford U., "Semantics Based Program Manipulation," $4,300 allotted for NYU.

1993 – 1996 Office of Naval Research N00014-93-1-0924, "Towards Increased Productivity of Algorithm Implementation," $325,000.

1993 – 1994 Office of Naval Research N00014-93-1-1036, "Focused Analysis of Transformational Programming Research," $19,959.

1993 – 1994 National Science Foundation MIP-9300210, "A Transformational Programming Environment for Hardware Specifications," $50,000.

1991 – 1994 Air Force Office of Scientific Research AFOSR-91-0308, "Transformational Implementation of Operations Research Algorithms," $427,713.

1990 – 1993 Office of Naval Research Grant No. N00014-90-J-1890, "Machine Assisted Implementation of Complex Algorithms and Labor Intensive Software," $346,192

1990 – 1991 Office of Naval Research Grant No. N00014-90-J-1421, "Workshop on the Derivation of Parallel Programs and Architectures," $15,000 (co-PI with John Reif)

1987 – 1990 Office of Naval Research Contract No. N00014-87-K-0461, "Transformational Programming Systems with Large Scale Automation," $344,457

1988 Thomson-CSF "Esprit Project SED" - Visitors Fund, $70,000 Co-PI with Edmond Schonberg

1984 – 1987 Office of Naval Research Grant No. N00014-84-K-0444, "Supercompilers - Transformational Programming Systems with Large Scale Automation," $276,000 + $16,500 supplement

Nov. 1986 ATT Foundation Special Purpose Grant, "Automatic Programming," $24,117 equipment grant

1983 – 1985 National Science Foundation Grant No. MCS-8212936, "Transformational Programming–Applications to Algorithms and Systems," $105,000

1982 – 1983 National Science Foundation Grant No. MCS-81-8110100, Amendment No. 1, "Automatic Checking of Semantic Integrity in Design Databases"

1979 – 1981 National Science Foundation Grant No. MCS-7905293, "An Implementation of Formal Differentiation" $56,343

Demonstrations of Software at Symposia and Workshops

1. "Towards Improving Productivity of Algorithm Implementation," CPM '92 Systems Demonstrations (with J. Cai); initial experiments with RAPTS suggesting five-fold improvements in programming productivity, May, 1992.
2. "Overview of the RAPTS System," ONR Workshop on Derivation of Parallel Programs and Architectures (with J. Cai); first implementation of semantic analysis by nonlinear datalog-like clauses using semi-naive evaluation, cf. article 10, Sept., 1991.
3. "The RAPTS Transformational Programming System," ESOP 90 Systems Exhibition (with J. Cai). First implementation of fast pattern matching, cf article 9, May, 1990.

4. "RAPTS-II," Eurocal 85, Linz, Austria. First implementation of fixed point iteration integrated with finite differencing and stream processing, cf conf. paper 6 and articles 5 and 8, April, 1985.
5. "RAPTS–The Rutgers Abstract Program Transformation System," Compiler Demonstration, Symposium on Compiler Construction, Boston, MA. First implementation of generalized finite differencing by the Chain Rule, cf article 1, June, 1982.

PUBLICATIONS

Books

1. Paige, R., Formal Differentiation - A Program Synthesis Technique, UMI Research Press, 1981 (277 pp); revised Ph.D. Thesis, NYU, June 1979, which appeared in Courant Computer Sci. Report #15, pp. 269 - 658, Sep. 1979.

Book Editorship

1. Parallel Algorithm Derivation and Program Transformation, R. Paige, J. Reif, and R. Wachter editors, Kluwer Press, 1993.

Journal Articles and Book Chapters

1. Paige, R. and Koenig, S., "Finite Differencing of Computable Expressions," ACM TOPLAS, IV(3), July, 1982, pp. 401-454; earlier version appeared as LCSR-TR-8, Rutgers U., New Brunswick, NJ, Aug. 80 [Revised Dec. 81].
2. Paige, R., "Applications of Finite Differencing to Database Integrity Control and Query/Transaction Optimization," in Advances in Database Theory Vol 2, pp. 171-210, eds. Gallaire, H, Minker, J., and Nicolas, J.M., Plenum Press, Mar., 1984.
3. Paige, R. "Towards a Science of Programming," Book Review of "Algorithmic Language and Program Development " by Bauer, F. and Wossner H., Science Of Computer Programming, Aug 1984, pp. 213 - 218.
4. Paige, R., "Supercompilers - Extended Abstract", in Program Transformation and Programming Environments, ed. P. Pepper, Springer-Verlag, 1984, pp. 331-340, invited paper.
5. Paige, R., Tarjan, R. and Bonic, R., "A Linear Time Solution to the Single Function Coarsest Partition Problem," Theoretical Comp. Sci., Vol. 40, No. 1, Sep. 1985, pp. 67 - 84 (special journal issue on best papers selected from ICALP 84).
6. Paige, R., "Programming with Invariants," IEEE Software, Vol. 3, No. 1, Jan. 1986, pp. 56-69 (special journal issue on best papers selected from HICSS-19).
7. Paige, R. and Henglein, F., "Mechanical Translation of Set Theoretic Problem Specifications Into Efficient RAM Code - A Case Study," Journal of Symbolic Computation, Vol. 4, No. 2, Aug. 1987, pp. 207 - 232.
8. Apostolico, A., Iliopoulos, C. and Paige, R., "An O(n log n) Cost Parallel Algorithm for the Single Function Coarsest Partition Problem," in Mathematical Research, Band 38, Parallel Algorithms and Architectures, eds A. Albrecht, H. Jung, and K. Mehlhorn, Akademie- Verlag, 1987.
9. Paige, R, Tarjan, R., "Three Partition Refinement Algorithms," SIAM Journal on Computing, Vol 16, No. 6, Dec. 1987, pp. 973 - 989.
10. Cai, J. and Paige, R., "Program Derivation by Fixed Point Computation," Science of Computer Programming, Vol 11, No. 3, 1988/1989, pp. 197 - 261; earlier version appeared as IBM RC 13947, 1988.
11. Cai, J., Facon, P., Henglein, F., Paige, R., and Schonberg, E., "Type Analysis and Data Structure Selection," in Constructing Programs From Specifications, ed. B. Moeller, North-Holland, 1991, pp. 126 - 164.

12. Cai, J., Paige, and Tarjan, R., "More Efficient Bottom-Up Multi-Pattern Matching In Trees," Theoretical Computer Science, Vol 106, Num 1, Nov. 1992, pp. 21 - 60; [Special issue of best papers selected from CAAP '90]; also, NYU-TR #604.
13. Cai, J. and Paige, R., "Languages Polynomial in the Input Plus Output," in Algebraic Methodology and Software Technology, M. Nivat, C. Rattray, T. Rus, and G. Scollo eds., Workshops in Computing Series, Springer-Verlag, 1992, 287 - 302.
14. Cai, J. and Paige, R., "Using Multiset Discrimination To Solve Language Processing Problems Without Hashing," Theoretical Computer Science, vol 145, Num 1-2, July, 1995, pp. 189-228; also DIKU-TR #94/16.
15. Bloom, B. and Paige, R., "Transformational Design and Implementation Of a New Efficient Solution to the Ready Simulation Problem," Science of Computer Programming, 24(3), June 1995, pp. 189-220.
16. Bouma, W., Cai, J., Fudos, I., Hoffmann, C., and Paige, R., "A Geometric Constraint Solver," CAD, Vol. 27, No. 6, June, 1995, pp. 487-501; also appears as Purdue U. TR 93-54.
17. Chang, C. and Paige, R., "From Regular Expressions to DFA's Using Compressed NFA's," Theoretical Computer Science, vol. 178(1-2), May, 1997, pp. 1-36.
18. Keller, J. P. and Paige, R., "Program Derivation With Verified Transformations - A Case Study," Communications of Pure and Applied Mathematics, Vol 48, No. 9-10, pp. 1053-1113, 1996.
19. Paige, R., "Future Directions in Program Transformations," http://www.acm.org/surveys/1996/PaigeFuture/, ACM Computing Surveys, 28A(4), Dec. 1996.
20. Goyal, D. and Paige, R., "The Formal Reconstruction and Improvement Of The Linear Time Fragment Of Willard's Relational Calculus Subset," in Algorithmic Languages and Calculi, Richard Bird and L.G.L.T. Meertens (Eds.), pp. 382 - 414, Chapman & Hall, London, 1997.

Conference Papers

1. Paige, R. and Schwartz, J. T., "Reduction in Strength of High Level Languages," September 1976, Moscow Proceedings Of High Level Languages (12 pp).
2. Paige, R. and Schwartz, J. T., "Expression Continuity and the Formal Differentiation of Algorithms," Proc. 4th ACM POPL, Jan. 1977, pp. 58 - 71; reprinted in Support du Cours, 'Techniques de Transformations et D'optimisation de Programmes', June, 1979, IRIA, France; earlier form appeared as SETL Newsletter #138, NYU/Courant TR, Apr. 1976.
3. Paige, R. and Koenig, S., "A Transformational Framework for the Automatic Control of Virtual Data," Proc. of the 7th Intl. Conference on VLDB, Sep. 1981, pp. 306-318.
4. Paige, R., "Applications of Finite Differencing to Database Integrity Control and Query/Transaction Optimization," Proc. Workshop on Logical Bases For Databases, Toulouse, France, Dec. 1982. see also article 2 for revised version.
5. Paige, R., "Transformational Programming, Applications to Algorithms and Systems," Proc. 10th ACM POPL, Jan. 1983, pp. 73-87.
6. Goldberg, A. and Paige, R., "Stream Processing", Proc. ACM Symp. on LISP and Functional Prog., pp. 53-62, Aug, 1984; earlier version appeared as LCSR-TR-46, Rutgers U., New Brunswick, NJ, Aug. 1983.
7. Paige, R. and Tarjan, R., "A Linear Time Algorithm to Solve the Single Function Coarsest Partition Problem," ICALP, Lecture Notes in Comp. Sci. 172, Springer-Verlag, Jul. 1984, pp 371-379. see article 5 for long form.
8. Paige, R. and Henglein, F., "Mechanical Translation of Set Theoretic Problem Specifications Into Efficient RAM Code - A Case Study," Eurocal 85 (European Conf. on Computer Algebra), Lecture Notes in Comp. Sci. 204, Springer-Verlag, Apr. 1985, pp. 554 - 567; also appeared as IBM RC 12169, 1986; see article 7 for long form.

9. Paige, R., "Programming with Invariants," Proc. Hawaii Intl. Conf. on Sys. Sciences, Jan. 1986; also appeared as IBM RC 11419, 1985; see article 6 for long form.

10. Cai, J. and Paige, R., "Binding Performance At Language Design Time," Proc. 14th ACM POPL, Jan. 1987, pp. 85-97.

11. Apostolico, A., Iliopoulos, C. and Paige, R., "An O(n log n) Cost Parallel Algorithm for the Single Function Coarsest Partition Problem," Proc. Intl. Workshop on Parallel Algorithms and Architectures, May, 1987; see article 8 for long form.

12. Paige, R., "Real-Time Simulation of a Set Machine on a RAM," ICCI '89, May, 1989, in Computing and Information, Vol. II, eds. R. Janicki and W. Koczkodaj, Canadian Scholars' Press, pp. 69 - 73.

13. Cai, J., Paige, R., and Tarjan, R., "More Efficient Bottom-Up Tree Pattern Matching," Proc. CAAP 1990, LNCS 431, Springer-Verlag, pp. 72 - 86, May, 1990; see article 9 for long form.

14. Paige, R., "Symbolic Finite Differencing - Part I," ESOP '90, LNCS 432, Springer-Verlag, May 1990, pp. 36 - 56, invited paper.

15. Cai, J. and Paige, R., "Look Ma, No Hashing and No Arrays Neither," Proc. 18th ACM POPL, Jan. 1991, pp. 143 - 154; see article 13 for long form.

16. Cai, J. and Paige, R., "Languages Polynomial in the Input Plus Output," Proc. AMAST '91, May, 1991; see article 14 for long form.

17. Cai, J., Facon, P., Henglein, F., Paige, R., and Schonberg, E., "Type Analysis and Data Structure Selection," IFIP TC2 Working Conf. On Constructing Programs From Specifications, May 1991; see Article 12 for long form.

18. Chang, C. and Paige, R., "From Regular Expressions to DFA's Using Compressed NFA's," LNCS 644, Springer-Verlag, eds. A. Apostolico, M. Crochemore, Z. Galil, and U. Manber, 1992, pp. 88-108, short form appeared in Proc. Third Symp. on Combinatorial Pattern Matching, Tucson, AZ, Apr. 1992, pp. 88 - 108; see article 16 for long form.

19. Bloom, B. and Paige, R., "Computing Ready Simulations Efficiently," in First North American Process Algebra Workshop, A. Zwarico and S. Purushothaman eds., Workshops in Computer Science Series, Springer-Verlag 1992, pp. 119 - 134; short form appeared in Proc. NAPAW, Stony Brook, NY , Aug. 1992; also appeared as NYU TR. #613, 1992; see article 15 for long form.

20. Cai, J. and Paige, R., "Towards Increased Productivity of Algorithm Implementation," Proc. ACM SIGSOFT 1993, pp. 71 - 78, in Soft. Eng. Notes, Vol. 18, Num. 5, Dec. 1993.

21. Paige, R., "Efficient Translation of External Input in a Dynamically Typed Language," Proc. IFIP Congress 94 - Vol 1, eds. B. Pehrson and I. Simon, Elsevier, Sept 1994, pp. 603 - 608.

22. Paige, R., "Atlantique Research Overview," Proc. Atlantique Workshop on Semantics Based Program Manipulation," eds. N. Jones and C. Talcott, DIKU Report 94/12, 1994.

23. Paige, R., "Viewing a program transformation system at work," Programming Language Implementation and Logic Programming, Proc. Joint 6th Intl. Conf. on Programming Language Implementation and Logic Programming (PLILP) and 4th Intl. Conf. on Algebraic and Logic Programming (ALP), LNCS 844, ed. M. Hermenegildo and J. Penjam, Sep. 1994, pp. 5 - 24.

24. Henriksen, J., Jensen, J., Jorgensen, M., Klarlund, N., Paige, R., Rauhe, T., and Sandholm, A., "Mona: Monadic Second-Order Logic In Practice," Proc. TACAS (Workshop on Tools and Algorithms for Construction and Analysis of Systems), pp. 58 - 73, May, 1995, Aarhus, Denmark. Long form appears in Tools and Algorithms for the Construction and Analysis of Systems, LNCS 1019, E. Brinksma, et. al editors, Springer-Verlag, 1995, pp. 89 - 110.

25. Keller, J. P. and Paige, R., "Program Derivation With Verified Transformations - A Case Study," Proc. Symp. Celebrating the Scientific Trajectory of Jack Schwartz, ed. E. Schonberg, May, 1995, New York City.

26. Paige, R., "Future Directions in Program Transformations," to appear SIGPLAN, 1996.

27. Paige, R. and Yang, Z., "High Level Reading and Data Structure Compilation," Proc. 24th POPL, Jan. 1997, pp. 456 - 469.
28. Goyal, D. and Paige, R., "The Formal Reconstruction and Improvement Of The Linear Time Fragment Of Willard's Relational Calculus Subset," IFIP TC2 Working Conf. on Algorithmic Languages and Calculi, Feb. 1997.
29. Goyal, D. and Paige, R., "A New Solution To The Hidden Copy Problem," In Proceedings of the 5th International Static Analysis Symposium, LNCS 1503, ed. G. Levi,pp. 327-348, Pisa, Italy, Sept. 1998.

Lecture Notes

1. Paige, R., "Analysis and Transformation of Set-Theoretic Languages," Mini-Course Notes, BRICS Notes Series, NS-95-5, University of Aarhus, Aarhus, Denmark, August 1995.

Software Systems

1. Cai, J. and Paige, R., "APTS - Pre-Release Version 1," 1993.