ESPRIT BR Project RAND-REC
(EC-US Exploratory Collaborative Activity –
EC-US030)

Annual Progress Report

July 1, 1994 – June 30, 1995

Contents

1 RAND-REC Research Sites

The research sites are:

- University of Bonn,
- University of Edinburgh,
- University of Lund,
- University of Oxford,
- University of Paris-Sud

  and

- International Computer Science Institute, Berkeley

2 Overview of Research Activities

The research within the project RAND-REC has concentrated on the following main research areas (see Section 3, Research Papers):

(1) Design of Efficient Randomized and Approximative Algorithms

(2) Efficient Parallel Algorithms

(3) VC Dimension of Sigmoidal and Pfaffian Neural Networks and Volume Approximation

(4) Derandomizing Algorithms and Probabilistic Methods

(5) Deterministic and Randomized PET (Priority Encoding Transmission) Systems

3 Research Papers (RAND-REC)

1. Alon, N., Edmonds, J., Luby, M.,
   Linear Time Erasure Codes With Nearly Optimal Recovery,
   Proc. 36th IEEE FOCS (1995), pp. 512-519.

2. A. Andersson and Ch. Mattsson, *Dynamic interpolation search in* $o(\log \log n)$ *time*, In Proc. ICALP '93, Lecture Notes in Computer Science 700, pp. 15-27, 1993.

3. A. Andersson and S. Nilsson, *A new efficient radix sort*, In Proc. 35th Annual IEEE Symposium FOCS, 1994.

4. A. Andersson and S. Nilsson, *Improved behaviour of tries by adaptive branching.* Information Processing Letters 46, pp. 295–300, 1993.

5. A. Andersson and S. Nilsson, *Efficient implementation of suffix trees.* In Software—Practice and Experience, 1994.

6. A. Andersson and S. Nilsson, *Faster searching in tries and quadtrees—an analysis of level compression.* In Proc. 2nd Annual European Symposium on Algorithms, Lecture Notes in Computer Science 855, pp. 82-93,1994.

7. A. Andersson and O. Petersson, co-authors Torben Hagerup and Johan Håstad, *The complexity of searching a sorted array of strings.* Proc. 26th Annual ACM Symposium on Theory of Computing, STOC '94, pp. 317–325, 1994.

8. A. Andersson, and S. Nilsson, co-authors T. Hagerup, and R. Raman, *Sorting in linear time?* In proc. 27th ACM Symposium on Theory of Computing, 1995.

9. Bloemer, J., Kalfane, M., Karp, R., Karpinski, M., Luby, M., Zuckerman, D., *An XOR-Based Erasure-Resilient Coding Scheme,*
Technical Report TR-95-048, International Computer Science Institute, Berkeley, 1995.

10. Dagum, P., Karp, R., Luby, M., Ross, Sheldon,
An Optimal Algorithm for Monte Carlo Estimation,
Proc. 36th IEEE FOCS (1995), pp. 142-149.

11. Anders Dessmark, Andrzej Lingas, co-author A. Maheshwari, *Multi-list ranking: complexity and applications.* Proc. 10th Symposium on Theoretical Aspects of Computer Science, Wurzburg, February 1993, Lecture Notes in Computer Science 665, pp. 306-316, Springer Verlag. Also, in Theoretical Computer Science 141 (1995) pp. 337-350.

12. Anders Dessmark and Andrzej Lingas, co-author K. Jansen. *The complexity of maximum k-dependent and f-dependent set.* In proceedings of ISAAC'93, Hong Kong, Lecture Notes in Computer Science , Springer Verlag.

13. Anders Dessmark, Andrzej Lingas and Oscar Garrido, *On f-Matching and the Degree Sequence Problem.* In Proc. MFCS, August 1994, Lecture Notes in Computer Science 841, Springer Verlag, pp. 316-325.

14. Oscar Garrido and Andrzej Lingas, co-author K. Diks, *Parallel algorithms for finding maximal k-dependent sets and maximal f-matchings.* In International Journal of Foundations of Computer Science, 1994.

15. Oscar Garrido and Andrzej Lingas, co-authors S. Jarominek, W. Rytter, *A simple randomized parallel algorithm for maximal f-matchings*, to appear in Information Processing Letters.

16. Karpinski, M.,
On the Power of Randomized Branching Programs,
to appear in Proc. 28th ICALP

17. Karpinski, M., Arora, S., Karger, D.,
Polynomial Time Approximation Schemes for Dense Instances of NP-Hard Problems,
Proc. 27th ACM STOC (1995), pp. 284-293

18. Karpinski, M., Cucker, F., Koiran, P., Lickteig, T.,
On Real Turing Machines that Poss Coins,
Proc. 27th ACM STOC (1995), pp. 335 - 342.

19. Karpinski, M., Macintyre, A.,
Polynomial Bounds for VC Dimension of Sigmoidal Neural Networks,
Proc. 27th ACM STOC (1995), pp. 200-208

20. Karpinski, M., Macintyre, A.,
Approximating the Volume of General Pfaffian Bodies
Research Report 85145-CS, University of Bonn, 1995.

21. Karpinski, M., Macintyre, A.,
Bounding VC Dimension for Neural Networks:
Progress and Prospects (Invited Lecture), Proc. EuroCOLT'95, Lecture Notes in Artificial Intelligence Vol. 904, Springer-Verlag, 1995, pp. 337-341.

22. Karpinski, M., Larmore, L., Rytter, W.,
Sequential and Parallel Subquadratic Work Algorithms for Constructing Approximately Optimal Binary Search Trees,
Proc. 7th ACM-SIAM SODA (1996).

23. Karpinski, M., Grigoriev, D., Meyer auf der Heide, F., Smolensky, R.,
A Lower Bound for Randomized Algebraic Decision Trees,
to appear in Proc. 28th ACM STOC (1996)

24. Karpinski, M., Grigoriev, D., Yao, A. C.,
An Exponential Lower Bound on the Size of Algebraic Decision Trees for MAX,
Research Report No. 85143-CS, University of Bonn, 1995.

25. Lamparter, B., Albanese, A., Kalfane, M., Luby, M.,
PET-Priority Encoding Transmission: A New, Robust and Efficient Video Broadcast Technology,
Proc. ACM Multimedia '95

26. Andrzej Lingas, co-author R. Klein. *Manhatanion Proximity in Simple Polygons.* Proc. of the ACM Symposium on Computational Geometry, Berlin, 1992. In the special issue of International Journal of Computational Geometry and Applications, Vol. 5, No. 1-2 (1995) 53-74.

27. Andrzej Lingas, co-author R. Klein. *A Linear-time Randomized Algorithm for the Bounded Voronoi Diagram of a Simple Polygon*. Proc. of the ACM Symposium on Computational Geometry, San Diego, 1993. To appear in the special issue of International Journal of Computational Geometry.

28. Andrzej Lingas, co-author R. Klein, *A note on generalizations of Chew's algorithm for the Voronoi diagram of a convex polygon*. Proc. 5th Canadian Conference on Computational Geometry, Waterloo, Canada, 1993.

29. Andrzej Lingas, co-author P. Berman, *A Nearly Optimal Parallel Algorithm for the Voronoi Diagram of a Convex Polygon*. In Proc. Scandinavian Workshop on Algorithm Theory, July 1994, Lecture Notes in Computer Science 824, Springer Verlag, pp. 73-82.

30. Andrzej Lingas, co-author R. Klein, *Fast skeleton construction*. Proc. 3rd Annual European Symposium on Algorithms, Lecture Notes in Computer Science 855, pp. 82-93,1994.

31. Luby, M., Randall, D., Sinclair, A.,
Markov Chair Algorithms for Planar Lattice Structures,
Proc. 36th IEEE FOCS (1995), pp. 150-159.