

Stephen William Davies

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Citizenship: Canadian

Education:

B.Sc.Eng. (Electrical) University of New Brunswick
May 1981

M.Sc.Eng. (Electrical) University of New Brunswick
May 1985

M.B.A. Dalhousie University February 1993

Ph.D. University of Toronto June 1999

Major Scholarships and Awards:

Association of Professional Engineers
(NB) Certificate of Merit, Garson
Memorial Prize

National Sciences and Engineering
Research Council Postgraduate
Scholarship

Killam Special Scholarship

National Sciences and Engineering
Research Council Postgraduate
Scholarship, U. of Toronto Open
Fellowship, Sumner Fellowship

M.Sc.Eng Thesis: "Estimation of Myoelectric Velocity Distribution Function"

Ph.D. Thesis: "Application of Communication Theory to Automatic DNA Sequencing"

This work focuses on the reduction of error rate and extension of reliable DNA sequence read length through exploiting techniques originally developed for data communications. It involved interdisciplinary collaboration with molecular biologists, a polymer physicist and Visual Genetics Inc. A key development was the model for timing jitter; this also led to what may be the first direct technique for the measurement of DNA Kuhn length (~spatial correlation length). Based on the model, a near optimum processor was derived. Large-scale simulations have yielded excellent results and sample trials with real data are consistent with expectations. The thesis has been nominated for a Canadian (NSERC) Doctoral Prize.

Work History:

2000, Jan. to present Assistant Professor, Institute for Biomaterials and Biomedical Engineering, and, Dept. of Electrical and Computer Engineering, University of Toronto, Canada. Applying communication theory to the extraction of sequential information in molecular biology.

1999, Jan. to Jan 2000 Member Technical Staff, Communication Sciences, Lucent Technologies / Bell Laboratories, Holmdel, NJ, USA. Conducted research into a 3rd/4th generation wireless data system. Studied current and near-term systems (IS-95, WB-CDMA, GSM/GPRS, UMTS, OFDM, IEEE 802.11, Mobile-IP, IPv6, CDPD, VoIP). Played key role in launch of major new venture.

1990, May to June 1995 Group Leader, Acoustic Signal Processing, Defence Research Establishment Atlantic (DREA), Dartmouth, NS, Canada. Led very successful new airborne sonar project, designed its signal processing and VME/system hardware architecture, and was Chief Scientist on sea trials of same. Participated in design of future low frequency active sonar [19]. Consultant on major acquisition programs; expert on sonar signal processing and operator machine interfaces. Directed research into new sonar detection algorithms by group scientists, university researchers and industrial contractors.

1984, Sept. to May 1990 Defence Scientist at DREA. Developed algorithms for both towed array and airborne sonars. Responsible for the functional specification of a major future airborne sonar system by a team of five [25]; currently (1998), this development is being fitted to operational maritime patrol aircraft. Led team developing novel in-buoy detection system. Participated in sea trials. Consultant on major acquisition programs.

1982, May-December Facsimile and teleconferencing hardware and software, Bell-Northern Research, Ottawa, ON, Canada.

Standard Tests: GRE Verbal 750 (top 2%) Quantitative 780 (top 6%) Analytical 740 (top 6%)

References: See covering letter.

Patents: “Method for Maximum Likelihood DNA Sequencing”, patent applied for.
“Coded DNA processing”, patent applied for.
“Handoff in Data Communications”, patent applied for.
“Arrangement for Facilitated Data Transfer”, patent applied for.
“Secure Handoff”, patent applied for.
“Paging in Data Communications”, patent applied for.

Publications:

Refereed Journal Publications:

- 1) S.W. Davies, M. Eizenman, S. Pasupathy, W. Muller, G. Slater, “Models of local behavior of DNA electrophoresis peak parameters”, *Electrophoresis* 1999, 20 No. 7, 1443-1454.
- 2) S.W. Davies, M. Eizenman, S. Pasupathy, "Optimal structure for automatic processing of DNA sequences", *IEEE Trans. Biomed. Eng.*, Vol.46, No.9, Sept. 1999, pp.1044-1056.
- 3) S.W. Davies, P.A. Parker, "Estimation of myoelectric conduction velocity distribution", *IEEE Trans. Biomed. Eng.*, Vol.34, No.5, pp.365-375, May, 1987.

Other Refereed Contributions:

- 4) S. Davies, M. Eizenman, S. Pasupathy, M. Yuwaraj, "Near Optimal DNA Sequencing", IEEE 21st Annual International Conference of the Engineering in Medicine and Biology Society, October 13-16, 1999, Atlanta, GA.
- 5) M. Yuwaraj, M. Eizenman, S. Davies, S. Pasupathy, "A Novel Hypothesis-Testing Technique for Resolving Overlapping Peaks in DNA Sequencing", IEEE 21st Annual International Conference of the Engineering in Medicine and Biology Society, October 13-16, 1999, Atlanta, GA.
- 6) S.W. Davies, M. Eizenman, S. Pasupathy, "Exploiting multi-channel information in systems with high symbol clock variance", 5th Canadian Workshop on Information Theory, Toronto, June 3-6, 1997.
- 7) D.S. Swingler, S.W. Davies, "Spatial harmonic extrapolation and interpolation for use with circular array beamforming", Proc. IEEE Pacific Rim Conference on Communications, Computers and Signal Processing, Victoria, BC, May 9-10, 1991.
- 8) S.W. Davies, M.A. Price, "Source localization by summing multiple correlator outputs", Proc. IEEE ICASSP 90, Albuquerque, NM, April 3-6, 1990.
- 9) S.W. Davies, S.D. Peters, J.B. Farrell, "Automatic detection of submerged broadband sources by a sonobuoy", Proc. Naval Symposium on Underwater Acoustics, Biloxi, MS, Nov. 14-16, 1989, also in Minutes 18th Meeting, TTCP-GTP-10, Auckland, NZ, Nov. 6-10, 1989.
- 10) J.S. Diamond, S.W. Davies, A.T. Ashley, R.C. Trider, "New display concepts in passive sonar", Proc. Naval Symposium on Underwater Acoustics, Biloxi, MS, Nov. 14-16, 1989.
- 11) S.W. Davies, P.A. Parker, "Innervation zone and delay density estimates", Proc. International Society of Electrophysiological Kinesiology Conf., Amsterdam, June, 1988.
- 12) S.W. Davies, M.E. Knappe, "Noise background normalization for simultaneous broadband and narrowband detection", Proc. IEEE ICASSP 88, New York, April 11-14, 1988.
- 13) S.W. Davies, R.S. Walker, "ORed-beam DIFAR processing for enhanced tonal detection", Proc. Naval Symposium on Underwater Acoustics, Johns Hopkins (APL) Laurel, MD, Nov. 3-5, 1987.
- 14) S.W. Davies, "Bearing accuracies for arctan processing of crossed dipole arrays", Proc. IEEE Oceans 87, Halifax, NS, Sept.28-Oct.1, 1987.
- 15) S.W. Davies, C.J. Bly, "Simulation of the broadband spatial response of a linear array in a dynamic underwater acoustic field", Proc. 1987 Summer Computer Simulation Conference, Montreal, PQ, July 27-30, 1987.
- 16) P.A. Parker, S.W. Davies, "Power spectra estimators of muscle conduction velocity", IEEE Engineering in Medicine and Biology Society 8th Annual Conf., Fort Worth, TX, Nov.7-10, 1986.
- 17) S.W. Davies, "Arctan bearing estimators", 13th. Biennial Symposium on Communications, Queen's U., Kingston, ON, June 2-4, 1986.
- 18) S.W. Davies, R.S. Walker, "Towed array broadband processing and display", Proc. Naval Symposium on Underwater Acoustics, San Diego, April 1-3, 1986.
- 19) Non-Refereed Contributions:
- 20) S.W. Davies, "Airborne sonar demonstrator (CASD) hardware and software lessons learned documentation", DREA/TM/95/221, July, 1995.

- 21) S.W. Davies, "DREA's airborne sonar demonstration program: recent experiences and future plans", Minutes 23rd Meeting, TTCP-GTP-10, Warminster, PA, Dec.5-9, 1994.¹
- 22) S.W. Davies, A.T. Ashley, "Signal processing and display for low frequency active sonar", Minutes, TTCP-GTP-9, Adelaide, Australia, Nov.1-4, 1994.
- 23) A.T. Ashley, S.W. Davies, J.B. Franklin, R.C. Trider, "Future Canadian acoustic USW systems", NATO Maritime Operations in 2015 Study, SACLANTCEN, LaSpezia, Italy, 11-15 April, 1994.
- 24) S.W. Davies, "Estimation of bandwidth for random signals with Gaussian spectra", DREA/N/SP/94/1, Dec., 1993.
- 25) J.N. Maksym, S.W. Davies, "Investigation into signal processing and neural networks for acoustic transients", Minutes 22nd Meeting, TTCP-GTP-10, Salisbury, Australia, Nov.30-Dec.3, 1993.
- 26) S.W. Davies, "XDAAP man-machine interface trials and results", Minutes 21st Meeting, TTCP-10, Victoria, BC, Nov.30-Dec.2, 1992.
- 27) S.W. Davies, "Cruise Report Q193B", DREA/CR/SP/Q193B, Dec., 1991.
- 28) S.W. Davies, "An update on DREA's XDAAP airborne acoustic processor", Minutes 20th Meeting, TTCP-GTP10, Farnborough, UK, Oct. 7-9, 1991.
- 29) S.W. Davies, A.T. Ashley, J.S. Diamond, P.J. Gergely, C.M. McIntyre, "Exploratory development of an airborne acoustic processor (XDAAP) functional description, version 1.0", DREA/TM/91/207, May, 1991.
- 30) S.W. Davies, "Cruise Report Q187", DREA/CR/SP/Q187, April, 1991.
- 31) J.S. Diamond, S.W. Davies, A.T. Ashley, R.C. Trider, "New passive sonar display concepts", Minutes 18th Meeting, TTCP-GTP-10, Auckland, NZ, Nov. 6-10, 1989.
- 32) R.S. Walker, S.W. Davies, "A review of acoustic processor options for the new shipborne aircraft", DREA/RN/SP/89/4, April, 1989.
- 33) B. Trenholm, J.A. Theriault, S.W. Davies, "Executive overview: evaluation of dipping sonar operations for NSA", DREA/N/AM/89/2, April, 1989.
- 34) S.W. Davies, S.D. Peters, J.B. Farrell, "DREA in-buoy signal processing concepts", DREA/N/SP/89/2, Feb., 1989.
- 35) J.B. Farrell, S.W. Davies, S.D. Peters, "Interim report: broad-band processing method for sonobuoys", DREA/RN/SA/89/1, Feb., 1989.
- 36) S.W. Davies, "Enhanced time-frequency analysis of underwater acoustic signals", Proc. CRAD Signal Processing Symposium, DREV, Valcartier, PQ, June 15-17, 1988.
- 37) S.W. Davies, J.B. Farrell, R.S. Walker, "A proposal for a microbuoy airborne acoustic sub-system", DREA/RN/UAD/88/2, April, 1988.
- 38) S.W. Davies, "Noise cross-correlations for omni and dipole sensors", DREA/RN/SP/88/2, Feb., 1988.
- 39) S.W. Davies, "Interbuoy arctan bearing estimates", Minutes 15th Meeting, TTCP-GTP-10, Adelaide, Australia, Nov., 1986.
- 40) S.W. Davies, "Signal processing and display for intersonobuoy correlation processing", Minutes 14th Meeting, TTCP-GTP-10, Warminster, PA, Oct., 1985.

¹ TTCP is the principal forum for the exchange of defence research data between Australia, Canada, New Zealand, United Kingdom and the United States.