

MICHAEL B. MATTHEWS

SUMMARY

Extensive R&D digital communications, wireless protocols, real-time signal processing, and embedded systems; business development with Government agencies; Linux system certification and administration; excellent technical writing skills.

RESEARCH INTERESTS

Signal detection/estimation; statistical signal processing; real-time signal processing in software-defined radio

EDUCATION

University of California, Irvine

B.Sc.E.E. 1981 — emphasis in signal processing and control theory

University of Washington, Seattle; University of Duisburg-Essen, Germany

M.Sc.E.E. 1985 — emphasis in digital communications, signal processing, and optimal control theory

Thesis: *The time-sequenced adaptive filter: An application to electrocardiogram signal estimation*

Advisors: Prof. Dean W. Lytle, Prof. James A. Ritcey; Prof. Heinz Luck

Swiss Federal Institute of Technology (ETH), Zurich, Switzerland

Ph.D.E.E. (Dr. sc. techn.) 1992 — emphasis in nonlinear estimation theory and statistical signal processing

Dissertation: *On the uniform approximation of nonlinear discrete-time fading-memory systems*

Advisors: Prof. George S. Moschytz, Prof. James L. Massey

PROFESSIONAL EXPERIENCE

2016 – Present

NorthWest Research Associates

Monterey, CA

Senior Research Scientist, Statistical Signal Processing Group

Research in signal estimation and detection, digital communications, and software-defined radio; SDR development of AIS modulator/demodulator with upper-layer protocols.

2013 – 2016

Orbital ATK

Monterey, CA

Chief Scientist, Advanced Signals and Cyber Group

Chief Scientist for 17-person R&D group specializing in digital communications and wireless protocols; technical lead for R&D programs; business development lead for R&D group; technical lead for product line of wireless protocol processors (VPX/x86/Virtex-7/Linux/GNU Radio/C++/Python).

2006 – 2013

ATK Space Systems

Monterey, CA

Director, Advanced Signals and Cyber Group

Director and site lead for 12-person, \$4M R&D group specializing in digital communications and wireless protocols; program manager and technical contributor for R&D program that developed a complete real-time LTE protocol processor using the GNU Radio SDR environment (x86/Linux/GNU Radio/C++/Python); business development lead for R&D group; responsible for all program awards.

2001 – 2006

Mission Research Corporation/ATK

Monterey, CA

Senior Research Engineer, Advanced Signal Processing Group

Developed spectrum analyzer for signal classifier (PCIe/x86/Linux/C++); real-time image processing system for optical turbulence compensation (VME/PPC/Linux/C++); FPGA-based FSK demodulator for gigE transceiver (VHDL); real-time detector/demodulator for GSM wireless protocol (x86/Linux/C++).

PROFESSIONAL EXPERIENCE (CONTINUED)

1996 – 1999, 2015 **U.S. Naval Postgraduate School** **Monterey, CA**
Lecturer, Department of Electrical and Computer Engineering
Graduate courses in communication theory (EO3424) and statistical signal processing (EC3410, EC3420).

2001 **Taygeta Scientific, Inc.** **Monterey, CA**
Engineering Consultant
Developed simulation of Earth crustal deformation (x86/Linux/OpenGL/C++).

1992 – 2001 **Monterey Bay Aquarium Research Institute** **Moss Landing, CA**
Research and Development Engineer, Engineering Group
Developed electronic subsystems and instrumentation for remotely operated submersible, aided inertial submarine navigation system, and camera/light servo controller (VME/PPC/VxWorks/C++); applied research in multi-resolution sampling and estimation of oceanographic fields; project manager for large-scale multi-platform upper-water-column field experiment in Monterey Bay.

1987 – 1992 **Swiss Federal Institute of Technology (ETH)** **Zurich, Switzerland**
Research Assistant, Signal and Information Processing Laboratory
Research in nonlinear system approximation, identification, and state estimation; teaching and administrative activities, including German translation and extensive technical editing of Laboratory's publications.

1985 – 1987 **Spacelabs, Inc.** **Redmond, WA**
Product Development Engineer, ECG Group
Developed hand-held 12-channel electrocardiogram data acquisition system, including analog front-end and microcontroller (V25) hardware design; real-time signal acquisition, digital filtering, and compression software (x86/ASM/C).

1984 – 1985 **University of Duisburg-Essen** **Duisburg, Germany**
Research Assistant, Department of Communications Theory
Research in adaptive filtering and estimation of electrocardiogram signals as part of a Master's exchange program with the University of Washington; board-level hardware design for fire detection instrumentation.

1981 – 1983 **Del Mar Avionics, Inc.** **Irvine, CA**
Product Development Engineer, Bionics Laboratory
Developed high-speed electrocardiogram analysis system, including analog front-end, signal processor hardware design, and electrocardiogram detection and pattern recognition software for arrhythmia analyzer (Z8000/ASM); product was widely sold to hospital Holter monitoring departments.

1980 – 1981 **United Medical Products, Inc.** **Irvine, CA**
Product Development Engineer, Development Group
Developed board-level analog and digital electronics for an automatic dialysis sterilization system.

1979 – 1980 **3-D Instruments, Inc.** **Huntington Beach, CA**
Junior Engineer, Engineering Department
Designed and analyzed precision mechanical and electronic pressure gauges.

DEVELOPMENT SKILLS

- Tools – MATLAB (5/5), GNU tools (4/5), Eclipse/Spyder (4/5)
- SDR – GNU Radio (5/5), X-Midas (4/5), REDHAWK (4/5)
- Programming Languages – C++ (5/5), Python (4/5), Unix shells (4/5), FORTRAN (3/5)
- Hardware – COTS-level and board-level hardware development and fabrication, Autodesk/EAGLE (3/5)
- Instrumentation – RF/electronics test & measurement (spectrum/network analyzers, D/O-scope)
- Technical writing – Extensive technical writing/editing in LaTeX (5/5) and MS Office (5/5) products
- Operating systems – Linux SMP (5/5, RHEL, Ubuntu, others), VxWorks (3/5), Windows (4/5)
- Linux system administration – Extensive Linux OS administrative experience, including certification and administration of classified IT system comprising 10+ servers, workstations, and appliances.

PERSONAL

- Born: May 15, 1959, Key West, Florida
- Fluent in written and spoken German

ACTIVITIES

Steering Committee, *Asilomar Conference on Signals, Systems, and Computers*, 1995 - present

Publications Chair and Editor, *Asilomar Conference on Signals, Systems, and Computers*, 1995 - present

Member, Institute for Electrical and Electronics Engineers

REFERENCES

Professor Roberto Cristi
Department of Electrical and Computer Engineering
Naval Post Graduate School
Monterey, California 93943, 831 656 2223

Professor Murali Tummala
Department of Electrical and Computer Engineering
Naval Post Graduate School
Monterey, California 93943, 831 656 2645

Professor Monique Fargues
Department of Electrical and Computer Engineering
Naval Post Graduate School
Monterey, California 93943, 831 656 2859

PUBLICATIONS

Full Papers

M.B. Matthews, "On the linear minimum-mean-squared-error estimation of an undersampled wide-sense stationary random process," *IEEE Transactions on Signal Processing*, Vol. 48, No. 1, pp. 272-275, January 2000.

M.B. Matthews, K. Johnson, "The MBARI upper-water-column science experiment," *Sea Technology*, Vol. 42, No. 2, pp. 53-58, December 2001.

M.B. Matthews, G.S. Moschytz, "The identification of nonlinear discrete-time fading-memory systems using neural network models," *IEEE Transactions on Circuits and Systems*, Vol. 41, No. 11, pp. 740-751, Nov. 1994.

M.B. Matthews, "On the uniform approximation of discrete-time fading-memory systems using neural network models," *Circuits, Systems and Signal Processing*, Vol. 12, No. 2, pp. 279-307, February 1993.

M.B. Matthews, "Nonlinear noise canceling using neural networks," *AGEN Communications*, Stiftung Hasler-Werke, No. 51, pp. 13-23, 1990.

M.B. Matthews, J.F. Leber, "Neurale Netzwerke: Ein Übersicht," *Bulletin of the Swiss Electronics Society (SEV)*, Vol. 15, pp. 923-932, August 1989, (Information Technology Society's 1989 Best Paper Award).

M.B. Matthews, "Dimension-reduction mapping techniques: an application to electromyogram cluster analysis," *Scientia Electronica*, Department of Electrical Engineering, Swiss Federal Institute of Technology, Zurich, Vol. 35, No. 2, pp. 1-60, 1989.

Conference Papers

M.B. Matthews, "The linear MMSE estimation of an aliased random process," *Proceedings 32nd Asilomar Conference on Signals, Systems, and Computers*, Pacific Grove, Vol. 2, pp. 1456-1460, November 1998.

M.B. Matthews, T.C. O'Reilly, D. Au, "IView – An integrated viewing system for ROV *Tiburón*," poster, *AGU-1998*, December 1998

M.B. Matthews, "An adaptive nonlinear filter structure," *Proceedings IEEE Symposium on Circuits and Systems*, Singapore, pp. 694-697, June 1991.

M.B. Matthews, "Neural network nonlinear adaptive filtering using the extended Kalman filter algorithm," *Proceedings 1990 International Neural Networks Conference*, Paris, Vol. 1, pp. 115-119, July 1990.

M.B. Matthews, "A state-space approach to adaptive nonlinear filtering using recurrent neural networks," *Proceedings 1990 LASTED Symposium on Artificial Intelligence Applications and Neural Networks*, Zurich, pp. 197-200, July 1990.

Technical Reports

M.B. Matthews, "Deterministic least-squares interpolation of sparsely sampled oceanographic fields – Incorporating *a priori* knowledge about the physical system using the theory of reproducing-kernel Hilbert spaces," *MBARI Technical Report 2000-4*, Monterey Bay Aquarium Research Institute, April 17, 2000.

M.B. Matthews, "The problem of optimal sampling of primary productivity fields," *MBARI Technical Report 2000-3*, Monterey Bay Aquarium Research Institute, September 1997.

M.B. Matthews, "A Kalman-filter-based heading estimator for ROV *Tiburon*," *MBARI Technical Report 2000-2*, Monterey Bay Aquarium Research Institute, February 2, 2000.

M.B. Matthews, "Power spectral density estimation of a stationary random process given uniformly sampled observations with intermittent gaps," *MBARI Technical Report 2000-1* Monterey Bay Aquarium Research Institute, January 24, 2000.

M.B. Matthews, "A theoretical investigation into the sampling of biological systems: Report on 97-P/1 research results," *MBARI Technical Report 98-2*, Monterey Bay Aquarium Research Institute, January 1998.

M.B. Matthews, "Interpolation and digital filtering algorithms for the processing of nonuniformly sampled primary productivity data," *MBARI Technical Report 98-1*, Monterey Bay Aquarium Research Institute, January 1998.

M.B. Matthews, "Nondeterministic objective analysis: Linear minimum-mean-squared-error interpolation of sparsely sampled oceanographic fields," *MBARI Technical Report No. 95-18*, Monterey Bay Aquarium Research Institute, September 1995.

M.B. Matthews, "Classical Bayesian estimation theory in the ocean sciences," *MBARI Technical Report No. 94-16*, Monterey Bay Aquarium Research Institute, July 1994.

M.B. Matthews, "On the uniform approximation of nonlinear discrete-time fading-memory systems using neural network models," *ETH Dissertation No. 9635*, Signal and Information Processing Laboratory, Swiss Federal Institute of Technology, Zurich, January 1992.

M. B. Matthews, "The time-sequenced adaptive filter: An application to electrocardiogram signal estimation," Master's Thesis, Department of Electrical Engineering, University of Washington, Seattle, 1985.