

Curriculum Vitae – Arnold Lee Swindlehurst

Education

1991, Ph.D., Stanford University, Electrical Engineering. Thesis advisor: Prof. Thomas Kailath. Dissertation title: “Applications of Subspace Fitting to Estimation and Identification.” Dissertation research was in the general area of parametric estimation theory, with applications to eigenstructure based methods for sensor array processing, spectral estimation, and system identification. Specific research emphasis included exploitation of regular sensor array structure for near- and far-field source location, effects of array perturbations on algorithm performance, and geometric methods for state-space system identification. Coursework emphasis: Signal Processing, Detection and Estimation Theory, Communications, Linear Systems and Control, System Identification, Matrix Theory.

1985, 1986, B.S. (summa cum laude), M.S., Brigham Young University, Electrical Engineering. Master’s Thesis advisor: Prof. Wynn Stirling. Thesis title: “Analysis of a Multivariate Empirical Bayes Classifier.” Course GPA of 3.96 on 4.0 scale. Coursework emphasis in Digital and Analog Signal Processing, Communication Systems, Linear Systems, and Mathematics.

Employment

2014-2017 Hans Fischer Senior Fellow, Institute for Advanced Studies, Technische Universität München, Munich, Germany. Conducting research with faculty and students at IAS and TUM on projects related to multi-antenna wireless communication and positioning systems.

2013-2016 Associate Dean for Research and Graduate Studies, Henry Samueli School of Engineering, University of California at Irvine, Irvine, CA. Responsible for administering graduate and professional programs of study in terms of recruitment, retention and graduate student well-being, monitoring graduate student progress and quality, facilitating faculty opportunities for extramural funding, supporting technology transfer efforts, managing research centers and institutes, and enhancing the visibility and outreach of the School’s research enterprise.

2009-2013 Associate Chair, Dept. of Electrical Engineering & Computer Science, University of California at Irvine, Irvine, CA. Responsible for all aspects of the UCI undergraduate Electrical Engineering program, including teaching assignments, ABET accreditation, advisement, curriculum issues, course substitutions, etc. Organized a major revision of the EE curriculum during 2009-11, which was approved for the freshman class of 2012.

2007-Present Professor, Dept. of Electrical Engineering & Computer Science, University of California at Irvine, Irvine, CA. Tenured academic position involving research, teaching, and various other administrative duties. Primary areas of research interest: signal processing and estimation theory, applications to wireless communications, geo-positioning, radar, sonar, *etc.* Active in IEEE Signal Processing Society affairs as an Editor-in-Chief (*IEEE Journal of Selected Topics in Signal Processing*), Associate Editor (*IEEE Transactions on Signal Processing*, *Signal Processing Magazine*, *EURASIP Journal on Wireless Communications & Networking*), reviewer, conference organizer, session chair, etc.

2006-2007 Vice-President of Research, ArrayComm LLC, San Jose, CA. On personal development leave from Brigham Young University. Responsible for all research activities at ArrayComm, including new algorithm development, testing, software implementation and testing. Manages a staff of 17 engineers working on advanced techniques for MIMO wireless communications, channel estimation, equalization, interference cancellation in various wireless protocols including

802.16e (WiMAX), 3GPP, PHS, GSM, S-DMB, etc.

2003-2006 Chair, Dept. of Electrical & Computer Engineering, Brigham Young University, Provo, Utah. Responsible for all operations of a 25-faculty, 850-student department (approximately 750 undergraduate and 100 graduate student), including oversight of undergraduate and graduate curriculum, admissions, faculty hiring and retention, external relations, office and technical staff, and department budgets.

2001-2007 Professor, Dept. of Electrical & Computer Engineering, Brigham Young University, Provo, Utah. Tenured academic position involving research, teaching, and various other administrative duties. Taught courses in Circuit Theory, Digital Electronics, Feedback Control Systems, Signals and Systems, Linear System Theory, Optimal Control, Detection and Estimation Theory, Array Signal Processing, Wireless Communications and System Identification. Served as both a member and chair of the department's Graduate Committee, which is responsible for establishment and enforcement of graduate school policies, graduate student admissions, and coordination of all graduate curriculum.

1997-2001 Associate Professor, Dept. of Electrical & Computer Engineering, Brigham Young University, Provo, Utah.

1996-1997 Visiting Professor, Joint Appointment at Uppsala University, Uppsala, Sweden, and at the Royal Institute of Technology, Stockholm, Sweden. Position held while on sabbatical leave from BYU. Taught a course entitled "Fundamentals of Signal Estimation Using Antenna Arrays" at both universities. Collaborated with several students and faculty at both universities on projects in radar and wireless communications. Gave seminars at various other universities and high-tech companies in Sweden and Finland.

1990-1996 Assistant Professor, Dept. of Electrical & Computer Engineering, Brigham Young University, Provo, Utah. Tenure-track position involving research, teaching, and various administrative duties. Conducted research as described above. Responsible for the development and coordination of all departmental courses in linear systems and control theory. Developed and taught two new graduate courses: ECEn 611 – Optimal Control Theory, and ECEn 612 – System Identification. Responsible for the evaluation, purchase, and supervision of all hardware and software for departmental PC and UNIX based computer systems. Oversaw the purchase or donation of over \$1,000,000 worth of computer equipment. Managed a staff of three technicians responsible for the maintenance of all department computer systems.

1988-1990 Research Assistant, Dept. of Electrical Engineering, Stanford University. Conducted research for PhD dissertation, as described below. Reviewed articles for a number of professional journals. Wrote proposals and reports for research contracts with various governmental agencies.

1986-1990 Electrical Engineer, ESL, Inc., Sunnyvale, California. Involved in the development of algorithms and architectures for a variety of radar and sonar signal processing applications, including airborne direction-finding, underwater target detection and tracking, and bistatic radar source localization. Managed two multi-year projects, one in ELF signal search and data processing, the other in underwater acoustic signal analysis. Also designed and built several small, special-purpose hardware modules for a radar data processing workstation.

1983-1986 Research Assistant, Department of Electrical Engineering, Brigham Young University, Provo, Utah. Involved in the following projects: implementation of a telephone spread spectrum communication system, development of sonar display normalization techniques, analysis of integer computation effects in FFTs, and thesis research in the area of

empirical Bayes pattern classification techniques.

1983-1984 Scientific Programmer, Eyring Research Institute of Provo, Utah. Wrote software and documentation for Minuteman missile simulation and trajectory prediction system.

Consulting Activities

- ESL, Inc., Sunnyvale, CA (consultant, 1990-92)
- E-Systems Corporation, Greenville, TX (consultant, 1993-94)
- Statistical Signal Processing, Inc., Napa, CA (consultant, 1993-94)
- San Diego Research Center, Inc., San Diego, CA (consultant, 2003-06)
- Tallwood Venture Capital, Palo Alto, CA (consultant, 2010)
- Sierra Nevada Corporation, Irvine, CA (consultant, 2010-11)
- *Vantage Controls Inc. vs. Lutron Electronics Co., Inc.*, Case No. 2:03-CV-00488TC, US District Court, District of Utah (expert witness, deposition taken, 2005)
- *Lutron Electronics Co., Inc. vs. Control4 Corporation*, Case No. 2:06-CV-00401 DAK, US District Court, District of Utah (expert witness, deposition taken, 2008)
- *Lutron Electronics Co., Inc. vs. Crestron Electronics Inc.*, Case No. 2:09-CV-707-CW-EJF, US District Court, District of Utah (expert witness, deposition taken, 2012)

Honors and Awards

- 2017 IEEE Signal Processing Society Donald G. Fink Overview Paper Award with Lu Lu, Geoffrey Ye Li, Alexei Ashikhmin, and Rui Zhang for “An Overview of Massive MIMO: Benefits and Challenges,” *IEEE Journal of Selected Topics in Signal Processing*, October, 2014
- 2016 Elected Foreign Member of the Royal Swedish Academy of Engineering Sciences (IVA)
- 2014 Hans Fischer Senior Fellowship, Institute for Advanced Studies, Technische Universität München.
- 2010 IEEE Signal Processing Society Best Paper Award with Quentin Spencer and Martin Haardt for “Zero-Forcing Methods for Downlink Spatial Multiplexing in Multi-User MIMO Channels,” *IEEE Transactions on Signal Processing*, February, 2004.
- 2006 IEEE Communications Society Stephen O. Rice Prize in the Field of Communications Theory for the two-part paper “A Vector-Perturbation Technique for Near-Capacity Multiantenna Multiuser Communication,” *IEEE Transactions on Communications*, January-March, 2005, co-authored with Dr. Christian Peel and Dr. Bert Hochwald.
- 2006 IEEE Signal Processing Society Best Paper Award with Geert Leus for “Blind and Semi-Blind Equalization for Generalized Space-Time Block Codes,” *IEEE Transactions on Signal Processing*, October, 2002.
- Engineering Educator Award, Department of Electrical & Computer Engineering, Brigham Young University, 2005 (annual award voted by students to department’s outstanding teacher).
- Karl G. Maeser Research and Creative Arts Award, Brigham Young University, 2004 (annual award given to university’s outstanding researcher).
- Elevated to Fellow of the Institute of Electrical and Electronics Engineers, 2004.
- Co-author of “Spatial Signature Estimation for Uniform Linear Arrays with Unknown Receiver Gains and Phases,” *IEEE Trans. on Signal Processing*, August, 1999, which received the 2001 IEEE Signal Processing Society’s Young Author Best Paper Award (primary author: David Asztély, co-author: Björn Ottersten).
- 2000 IEEE W. R. G. Baker Prize Paper Award with Petre Stoica for “Maximum Likelihood Methods in Radar Array Signal Processing,” *IEEE Proceedings*, February, 1998.
- 1998 Outstanding Faculty Award, Department of Electrical & Computer Engineering, Brigham Young University.
- 1986 Outstanding Thesis, College of Engineering and Technology, Brigham Young University.
- 1985-1988 Office of Naval Research Graduate Fellowship.

Professional Activities

- Co-Technical Program Chair, *6th IEEE Global Conference on Signal and Information Processing*, to be held Nov. 2018 in Anaheim, CA.
- Special Guest Editor, *IEEE Journal of Selected Topics in Signal Processing*, for special issue on “Signal Processing for Large-Scale MIMO,” October, 2014.
- Special Guest Editor, *IEEE Journal on Selected Areas in Communications*, for special issue on “Signal Processing Techniques for Wireless Physical Layer Security,” September, 2013.
- Member, Awards Board, *IEEE Signal Processing Society*, 2012-2015.
- Co-organizer and Technical Program Co-Chair, *4th IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing*, held Dec. 2011 in San Juan, Puerto Rico (approximately 120 accepted papers).
- Member, Sensor Array and Multichannel (SAM) Signal Processing Technical Committee, *IEEE Signal Processing Society*, 2010-2016.
- Member, Nominations and Appointments Committee, *IEEE Signal Processing Society*, 2010-2013.
- Co-organizer and Co-Technical Program Chair, *IEEE International Conference on Acoustics, Speech and Signal Processing*, held April 2008 in Las Vegas, NV (over 2800 submissions, 1400 accepted papers).
- Founding Editor-in-Chief, *IEEE Journal on Selected Topics in Signal Processing*, 2006-2009.
- Member, Editorial Board, *IEEE Signal Processing Magazine*, 2006-2009.
- Special Guest Editor, *IEEE Signal Processing Magazine*, for special issue on “Signal Processing for Positioning and Navigation” which appeared in 2005.
- Associate Editor, *EURASIP Journal on Wireless Communications and Networking*, 2003-2010. Organized a special session of the journal on “Multi-User MIMO Networks” in 2004.
- Member, Sensor Array and Multichannel (SAM) Signal Processing Technical Committee, *IEEE Signal Processing Society*, 2003-2006.
- Secretary, *IEEE Signal Processing Society*. Elected to term beginning January 1, 2002, and ending December 31, 2004. Voting member of the Signal Processing Society’s Board of Governors and Executive Committee. Liaison with appointed representatives to other organizations.
- Co-organizer and Technical Program Chair, *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, held May 2001, in Salt Lake City, Utah (over 2000 submissions, 1000 accepted papers).
- Member and Vice-Chair, Signal Processing for Communications (SPCOM) Technical Committee, *IEEE Signal Processing Society*, 1998-2000.
- Associate Editor, *IEEE Transactions on Signal Processing*, 1995-1997.
- President and co-Founder, Utah Chapter of the *IEEE Signal Processing* and *IEEE Communications* societies, 1994-1996.
- Co-organizer and Technical Program Chair, *IEEE Digital Signal Processing Workshop*, held August, 1998, at Ruby’s Inn near Bryce Canyon, Utah (approximately 220 submissions).

- Member, Statistical Signal and Array Processing (SSAP) Technical Committee, *IEEE Signal Processing Society*, 1996-1998.
- Problems editor for 3rd edition of *Feedback Control of Dynamic Systems* by Franklin, Powell, and Emami-Naeini; Addison-Wesley Publishing. Coordinated the work of the authors and external contributors in augmenting and revising all problem sets for the textbook.
- Reviewer for numerous textbooks, research monographs, IEEE journals, and IEEE conferences.
- Member of Technical Program Committee for numerous IEEE conferences.

Research Grants

Items in the list below that are preceded by * indicate grants for which Prof. Swindlehurst was the Principal Investigator.

***2018-2021 National Science Foundation:** “Energy Efficient Millimeter Wave Massive MIMO Wireless Communications” (\$659,356)

***2017-2021 National Science Foundation:** “Low Resolution Sampling with Generalized Thresholds” (\$399,888)

***2015-2018 National Science Foundation:** “Millimeter Wave Massive MIMO: A New Frontier for Enhanced Radio Access” (\$633,000)

***2012-2013 California-Catalonia Engineering Innovation Program:** “Multicarrier Signals for Combined Positioning and Communications Systems: Contributions to Positioning in LTE” (\$12,500)

***2011-2014 National Science Foundation:** “Jamming in Wireless Networks: Offensive Strategies and Cooperation” (\$368,940)

***2011-2012 California-Catalonia Engineering Innovation Program:** “Multicarrier Signals for Combined Positioning and Communications Systems: Contributions to Scheduling and Synchronization in LTE” (\$40,000)

***2010-2011 California-Catalonia Engineering Innovation Program:** “Multicarrier Signals for Combined Positioning and Communications Systems: Design and Implementation Aspects” (\$41,000)

2010-2013 Air Force Office of Scientific Research: “NetSense: Optimizing Network Configuration for Sensing” (\$584,687)

***2009-2011 Dynetics, Inc:** “Integrated Multi-Modal RF Sensing” (\$187,300)

***2009-2010 California-Catalonia Engineering Innovation Program:** “Signal Design for Combined Positioning and Communications Systems” (\$35,000)

***2009-2013 National Science Foundation:** “Physical Layer Optimization for Cognitive Sensor Networks” (\$305,948)

2007-2012 Army Research Office, Multidisciplinary University Research Initiative (MURI, subcontract through University of California at Davis): “ARSENAL: A cross layer ARchitecture for SEcure resilieNt tacticAL mobile ad hoc networks” (\$490,000)

***2004-2009 National Science Foundation:** “Distributed Control and Communications for Multiple Miniature Unmanned Air Vehicles” (\$1,109,475)

2004-2009 Army Research Office, Multidisciplinary University Research Initiative (MURI, subcontract through University of California at San Diego): “Directional Routing and Scheduling for Secure Mobile Ad-Hoc Networks” (\$627,713)

***2003-2007 National Science Foundation:** “Multi-user, Multi-antenna Networks: Achieving High Capacity in a Mutual Interference Environment” (\$354,042)

***2000-2004 National Science Foundation:** “Analysis of the Capacity Improvement for Wireless Networks with Multiple Transmit and Receive Antennas” (\$499,761)

***2000-2003 National Science Foundation:** “Development of a Comprehensive Real-Time Instrument for MIMO Wireless Channel Measurement and Space-Time Coding Implementation” (\$370,567)

***2000-2002 Office of Naval Research:** “Parametric Methods for Range-Varying and Hot Clutter Mitigation” (\$183,512)

***1999-2002 National Science Foundation:** “Modeling and Design for the Lower Layers of 4th Generation Indoor/Outdoor Wireless Networks” (\$697,636)

***1999 Office of Naval Research:** “Parametric Methods for Interference and Calibration Error Mitigation in Circular Array STAP” (\$60,313)

***1996-1998 Office of Naval Research:** “Spatio-Temporal Signal Processing in Severe Environments” (\$145,000)

***1995-1997 National Science Foundation:** “Analysis and Development of Algorithms for Antenna Array Based Communication Systems” (\$99,731)

***1995-1996 National Security Agency, Center for Research in Applied Signal Processing:** “Blind Equalization of Multipath Channels Using a Narrowband Antenna Array” (\$18,000)

***1991-1994 National Science Foundation Research Initiation Award:** “Subspace Fitting Algorithms for State Space System Identification” (\$60,000)

***1992 National Science Foundation:** “Research Initiation Equipment Supplement” (\$10,000, awarded to support NSF research outlined above)

***1992 Space Dynamics Laboratory:** “Algorithm Development for SPIRIT III Data Processing Center” (\$55,749)

***1991-1992 ESL, Inc.:** “High Resolution Direction Finding: Algorithms and Analysis” (\$29,511)

Publication List

Peer-Reviewed Journal Articles

- [J1] W.C. Stirling and A.L. Swindlehurst, "Decision-Directed Multivariate Empirical Bayes Classification with Nonstationary Priors," *IEEE Trans. on Pattern Analysis and Machine Intelligence*, Vol. PAM-9, No. 5, pp. 644-680, Sept., 1987.
- [J2] A. Swindlehurst and T. Kailath, "On the Sensitivity of the ESPRIT Algorithm to Non-Identical Subarrays," *Sādhanā, Indian Academy of Sciences Proc. in Eng. Sciences*, Vol. 15, Part 3, pp. 197-212, Nov., 1990.
- [J3] A. Swindlehurst, B. Ottersten, R. Roy, and T. Kailath, "Multiple Invariance ESPRIT," *IEEE Trans. Signal Processing*, Vol. 40, No. 4, pp. 867-881, April, 1992.
- [J4] A. Swindlehurst and T. Kailath, "A Performance Analysis of Subspace-Based Methods in the Presence of Modeling Errors - Part I: The MUSIC Algorithm," *IEEE Trans. Signal Processing*, Vol. 40, No. 7, pp. 1758-1774, July, 1992.
- [J5] A. Swindlehurst, "DOA Identifiability for Rotationally Invariant Arrays," *IEEE Trans. Signal Processing*, Vol. 40, No. 7, pp. 1825-1828, July, 1992.
- [J6] A. Swindlehurst and T. Kailath, "Algorithms for Azimuth/Elevation Direction Finding Using Regular Array Geometries," *IEEE Trans. on Aerospace and Electronic Systems*, Vol. 29, No. 1, pp. 145-156, Jan., 1993.
- [J7] A. Swindlehurst and T. Kailath, "A Performance Analysis of Subspace-Based Methods in the Presence of Modeling Errors - Part II: Multidimensional Algorithms," *IEEE Trans. Signal Processing*, Vol. 41, No. 9, pp. 2882-2890, Sept., 1993.
- [J8] A. van der Veen, E. Deprettere, and A. Swindlehurst, "Subspace Based Signal Analysis using Singular Value Decomposition," *Proc. IEEE*, Vol. 81, No. 9, pp. 1277-1308, Sept., 1993.
- [J9] A. Swindlehurst and M. Viberg, "Subspace Fitting with Diversely Polarized Antenna Arrays," *IEEE Trans. on Antennas and Propagation*, Vol. 41, No. 12, pp. 1687-1694, Dec., 1993.
- [J10] A. Swindlehurst and J. Yang, "Using Least-Squares to Improve Blind Signal Copy Performance," *IEEE Signal Processing Letters*, Vol. 1, No. 5, pp. 80-82, May, 1994.
- [J11] M. Viberg and A. Swindlehurst, "Analysis of the Combined Effects of Finite Samples and Model Errors on Array Processing Performance," *IEEE Trans. Signal Processing*, Vol. 42, No. 11, pp. 3073-3083, Nov., 1994.
- [J12] A. Swindlehurst, "Alternative Algorithm for Maximum Likelihood DOA Estimation and Detection," *IEE Proc. F - Radar and Signal Processing*, Vol. 141, No. 6, pp. 293-299, Dec., 1994.
- [J13] M. Viberg and A. Swindlehurst, "A Bayesian Approach to Auto-Calibration for Parametric Array Signal Processing," *IEEE Trans. Signal Processing*, Vol. 42, No. 12, pp. 3495-3507, Dec., 1994.
- [J14] A. Swindlehurst, R. Roy, B. Ottersten, and T. Kailath, "A Subspace Fitting Approach for Identification of Linear State Space Models," *IEEE Trans. Automatic Control*, Vol. 40, No. 2, pp. 311-316, Feb., 1995.

- [J15] J. Yang and A. Swindlehurst, "The Effects of Array Calibration Errors on DF-Based Signal Copy Performance," *IEEE Trans. Signal Processing*, Vol. 43, No. 11, pp. 2724-2732, Nov., 1995.
- [J16] A. Swindlehurst, S. Daas, and J. Yang, "Analysis of a Decision-Directed Beamformer," *IEEE Trans. Signal Processing*, Vol. 43, No. 12, pp. 2920-2927, Dec., 1995.
- [J17] A. Swindlehurst, "Detection and Estimation in the Presence of Signals with Uncalibrated Spatial Signature," *Signal Processing*, Vol. 50, No. 1-2, pp. 29-37, April, 1996.
- [J18] A. Swindlehurst, "Normalized Adaptive Decision Directed Equalization," *IEEE Signal Processing Letters*, Vol. 5, No. 1, pp. 18-20, Jan., 1998.
- [J19] A. Swindlehurst and P. Stoica, "Maximum Likelihood Methods in Radar Array Signal Processing," *Proc. IEEE*, Vol. 86, No. 2, pp. 421-441, Feb., 1998. **(Received 2000 IEEE W.R.G. Baker Prize Paper Award).**
- [J20] A. Swindlehurst, "Time Delay and Spatial Signature Estimation Using Known Asynchronous Signals," *IEEE Trans. Signal Processing*, Vol. 46, No. 2, pp. 449-462, Feb., 1998.
- [J21] D. Asztély, B. Ottersten, and A. Swindlehurst, "A Generalized Array Manifold Model for Communication Channels with Local Scattering," *IEE Proceedings, Radar, Sonar, & Navigation*, Vol. 145, No. 1, pp. 51-57, Feb., 1998.
- [J22] M. Jansson, A. Swindlehurst, and B. Ottersten, "Weighted Subspace Fitting for General Array Error Models," *IEEE Trans. Signal Processing*, Vol. 46, No. 9, pp. 2484-2498, Sept., 1998.
- [J23] A. Jakobsson, A. Swindlehurst, and P. Stoica, "Subspace-Based Estimation of Time Delays and Doppler Shifts," *IEEE Trans. Signal Processing*, Vol. 46, No. 9, pp. 2472-2483, Sept., 1998.
- [J24] A. Swindlehurst, "Sensor Array Signal Processing," *IEEE Signal Processing Magazine*, Vol. 15, No. 5, pp. 45-48, Sept., 1998.
- [J25] J. Sorelius, R. Moses, T. Söderström, and A. Swindlehurst, "Effects of Non-Zero Bandwidth on Direction of Arrival Estimators in Array Signal Processing," *IEE Proceedings, Radar, Sonar, & Navigation*, Vol. 145, No. 6, pp. 317-324, Dec., 1998.
- [J26] B. Ottersten and A. Swindlehurst, "Antenna Arrays for Wireless Networks," *IEEE Signal Processing Magazine*, Vol. 16, No. 2, pp. 25-27, March, 1999.
- [J27] A. Swindlehurst and J. Gunther, "Methods for Blind Equalization and Resolution of Overlapping Echoes of Unknown Shape," *IEEE Trans. Signal Processing*, Vol. 47, No. 5, pp. 1245-1254, May, 1999.
- [J28] P. Stoica, A. Jakobsson, and A. Swindlehurst, "On the Identifiability of Multipath Parameters," *Signal Processing*, Vol. 74, No. 3, pp. 327-330, May, 1999.
- [J29] D. Asztély, A. Swindlehurst, and B. Ottersten, "Spatial Signature Estimation for Uniform Linear Arrays with Unknown Receiver Gains and Phases," *IEEE Trans. Signal Processing*, Vol. 47, No. 8, pp. 2128-2138, Aug., 1999. **(Received 2001 IEEE Signal Processing Society Young Author Best Paper Award).**
- [J30] Q. Spencer, B. Jeffs, M. Jensen, and A. Swindlehurst, "Modeling the Statistical Time and Angle of Arrival Characteristics of an Indoor Multipath Channel," *IEEE Journal on Selected Areas in Comm.*, Vol. 18, No. 3, pp. 347-360, March, 2000.

- [J31] J. Gunther and A. Swindlehurst, "On the Use of Kernel Structure for Blind Equalization," *IEEE Trans. Signal Processing*, Vol. 48, No. 3, pp. 799-809, March, 2000.
- [J32] J. Gunther and A. Swindlehurst, "Recursive Blind Symbol Estimation of Convolutionally Coded Co-Channel Signals," *IEEE Trans. Signal Processing*, Vol. 48, No. 4, pp. 956-965, April, 2000.
- [J33] G. Seco, J. Fernández-Rubio, and A. Swindlehurst, "Code-Timing Synchronization in DS-CDMA Systems Using Space-Time Diversity," *Signal Processing*, Vol. 81, pp. 1581-1602, Aug., 2001.
- [J34] A. Swindlehurst, P. Stoica, and M. Jansson, "Exploiting Arrays with Multiple Invariances Using MUSIC and MODE," *IEEE Trans. Signal Processing*, Vol. 49, No. 11, pp. 2511-2521, Nov., 2001.
- [J35] A. Swindlehurst and G. Leus, "Blind and Semi-Blind Equalization for Generalized Space-Time Block Codes," *IEEE Trans. Signal Processing*, Vol. 50, No. 10, pp. 2489-2498, Oct., 2002. **(Received 2006 IEEE Signal Processing Society Best Paper Award).**
- [J36] J. Wallace, M. Jensen, A. Swindlehurst, and B. Jeffs, "Experimental Characterization of the MIMO Wireless Channel: Data Acquisition and Analysis," *IEEE Trans. Wireless Communications*, Vol. 2, No. 2, pp. 335-343, March, 2003.
- [J37] P. Parker and A. Swindlehurst, "Space-Time Auto-Regressive Filtering for Matched Subspace STAP," *IEEE Trans. Aerospace & Electronic Systems*, Vol. 39, No. 2, pp. 510-520, April, 2003.
- [J38] C. Peel and A. Swindlehurst, "Effective SNR for Space-Time Modulation Over a Time-Varying Rician Channel," *IEEE Trans. Communications*, Vol. 52, No. 1, pp. 17-23, Jan., 2004.
- [J39] Q. Spencer, A. Swindlehurst and M. Haardt, "Zero-Forcing Methods for Downlink Spatial Multiplexing in Multi-User MIMO Channels," *IEEE Trans. Signal Processing*, Vol. 52, No. 2, pp. 461-471, Feb., 2004. **(Received 2010 IEEE Signal Processing Society Best Paper Award).**
- [J40] C. Peel and A. Swindlehurst, "Performance of Space-Time Modulation for a Generalized Time-Varying Rician Channel Model," *IEEE Trans. Wireless Communications*, Vol. 3, No. 3, pp. 1003-1012, May, 2004.
- [J41] Q. Spencer, C. Peel, A. Swindlehurst and M. Haardt, "An Introduction to the Multi-User MIMO Downlink," *IEEE Communications Magazine*, Vol. 42, No. 10, pp. 60-67, Oct., 2004.
- [J42] Q. Spencer, T. Svantesson and A. Swindlehurst, "Performance of MIMO Spatial Multiplexing Algorithms Using Indoor Channel Measurements and Models," *Wireless Communications and Mobile Computing*, Vol. 4, No. 7, pp. 739-754, Nov., 2004.
- [J43] Q. Spencer and A. Swindlehurst, "A Hybrid Approach to Spatial Multiplexing in Multi-User MIMO Downlinks," *EURASIP Journal on Wireless Communications and Networking*, Vol. 2004, Article ID 960305, 12 pages, Dec., 2004.
- [J44] C. Peel, B. Hochwald, and A. Swindlehurst, "A Vector-Perturbation Technique for Near-Capacity Multi-Antenna Multi-User Communication – Part I: Channel Inversion and Regularization," *IEEE Trans. Communications*, Vol. 53, No. 1, pp. 195-202, Jan., 2005. **(Together with [J45], received the 2006 IEEE Communications Society Stephen O. Rice Prize in the Field of Communications Theory).**

- [J45] B. Hochwald, C. Peel, and A. Swindlehurst, "A Vector-Perturbation Technique for Near-Capacity Multi-Antenna Multi-User Communication – Part II: Perturbation," *IEEE Trans. Communications*, Vol. 53, No. 3, pp. 537-544, March, 2005.
- [J46] T. Svantesson and A. Swindlehurst, "A Performance Bound for Prediction of MIMO Channels," *IEEE Trans. Signal Processing*, Vol. 54, No. 2, pp. 520-529, Feb., 2006.
- [J47] M. Zorzi, J. Zeidler, A. Anderson, A. Swindlehurst, M. Jensen, S. Krishnamurthy, B. Rao, J. Proakis, "Cross-Layer Issues in MAC Protocol Design for MIMO ad hoc Networks," *IEEE Wireless Communications Magazine*, Vol. 13, No. 4, pp. 62-76, Aug., 2006.
- [J48] C. Peel and A. Swindlehurst, "Throughput-Optimal Training for a Time-Varying Multi-Antenna Channel," *IEEE Trans. Wireless Communications*, Vol. 6, No. 9, pp. 3364-3373, Sept., 2007.
- [J49] Y. Rong, Y. Hua, A. Swami and A. Swindlehurst, "Space-Time Power Schedule for Distributed MIMO Links without Instantaneous Channel State Information at the Transmitting Nodes," *IEEE Trans. Signal Processing*, Vol. 56, No. 2, pp. 686-701, Feb., 2008.
- [J50] M. Larsen, A. Swindlehurst and T. Svantesson, "Performance Bounds for MIMO-OFDM Channel Estimation," *IEEE Trans. Signal Processing*, Vol. 57, No. 5, pp. 1901-1916, May, 2009.
- [J51] M. Nokleby and A. Swindlehurst, "Bargaining and MISO Interference Channel," *EURASIP Journal of Applied Signal Processing*, Vol. 2009, Article ID 368547, 13 pages, 2009.
- [J52] Z. Han, A. Swindlehurst and K. J. R. Liu, "Optimization of MANET Connectivity via Smart Deployment/Movement of Unmanned Air Vehicles" *IEEE Trans. Vehicular Technology*, Vol. 58, No. 7, pp. 3533-3546, Sept., 2009.
- [J53] P. Zhan, D. Casbeer and A. Swindlehurst, "Adaptive Mobile Sensor Positioning for Multi-Static Target Tracking," *IEEE Trans. Aerospace & Electronic Systems*, Vol. 46, No. 1, pp. 120-132, Jan., 2010.
- [J54] A. Mukherjee and A. Swindlehurst, "Robust Beamforming for Security in MIMO Wiretap Channels with Imperfect CSI," *IEEE Trans. Signal Processing*, Vol. 59, No. 1, pp. 351-361, Jan. 2011.
- [J55] P. Zhan, K. Yu and A. Swindlehurst, "Wireless Relay Communications with Unmanned Aerial Vehicles: Performance and Optimization," *IEEE Trans. Aerospace & Electronic Systems*, Vol. 47, No. 3, pp. 2068-2085, July, 2011.
- [J56] F. Antreich, J. Nossek, G. Seco-Granados and A. Swindlehurst, "The Extended Invariance Principle for Signal Parameter Estimation in an Unknown Spatial Field," *IEEE Trans. Signal Processing*, Vol. 59, No. 7, pp. 3213-3225, July, 2011.
- [J57] A. Fakoorian and A. Swindlehurst, "MIMO Interference Channel with Confidential Messages: Achievable Secrecy Rates and Precoder Design," *IEEE Trans. Information Forensics and Security*, Vol. 6, No. 3, pp. 640-649, Sept., 2011.
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