CURRICULUM VITAE

Stacy Lynne Tantum

Assistant Research Professor
Department of Electrical and Computer Engineering, Duke University
129 Hudson Hall, Box 90291, Durham, NC 27708–0291
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EDUCATION

Ph.D. December 1998
Electrical and Computer Engineering (Concentration: Signal Processing)
Dissertation title: Bayesian Matched-Field Approaches to Ocean Acoustic Source Tracking and Depth Classification
Duke University, Graduate School
Durham, North Carolina

M.S. May 1996
Electrical and Computer Engineering (Concentration: Signal Processing)
Thesis title: Short Range Source Tracking in an Uncertain Shallow Water Environment
Duke University, Graduate School
Durham, North Carolina

B.S.E.E. May 1994
Electrical/Computer Engineering and Economics, *summa cum laude*
Tufts University, College of Engineering
Medford, Massachusetts

RESEARCH INTERESTS

Signal detection and estimation theory, statistical signal processing, remote sensing, matched-field processing, and ocean acoustics.

EXPERIENCE

Duke University, Durham, NC — March 1999 – present
ASSISTANT RESEARCH PROFESSOR, Department of Electrical and Computer Engineering.

SAIC, Inc., San Diego, CA — April 2003 – April 2004
CONSULTANT.

AETC, Inc., Arlington, VA — September 2002 – April 2003
CONSULTANT.

Digital System Resources, Inc., Fairfax, VA — January 1997 – December 1999
PROFESSIONAL ASSOCIATE.

Duke University, Durham, NC — January 1999 – February 1999
RESEARCH ASSOCIATE, Department of Electrical and Computer Engineering.

Duke University, Durham, NC — September 1994 – December 1998
TEACHING/RESEARCH ASSISTANT, Department of Electrical and Computer Engineering.

SACLANT Undersea Research Centre, La Spezia, Italy — June 1996 – August 1996
SUMMER RESEARCH ASSISTANT, Environmental Modeling Group.

GRANTS AND CONTRACTS

[1] Principal Investigator, "Algorithm Development for an Advanced PELAN System for Surface and Sub-Surface UXO Discrimination," SAIC, Inc. subcontract in support of Environmental Security Technology Certification Program (ESTCP) project, $130,000, 5/1/2005 – 4/30/2008 . (Leslie Collins, co-PI)

[2] Principal Investigator, "Signal Processing for Handheld UXO Sensor Improvements," AETC, Inc. subcontract in support of Strategic Environmental Research and Development Program (SERDP) project UX–1381, $303,000, 7/1/2004 – 6/30/3007. (Leslie Collins, co-PI)

[3] Co-Principal Investigator, "Improved Analysis Algorithms for UXO Filler Identification," SAIC, Inc. subcontract in support of Strategic Environmental Research and Development Program (SERDP) project UX–1383, $100,000, 4/7/2004 – 2/10/2005. (Leslie Collins, PI)

[4] Co-Principal Investigator, "Software analysis/algorithm development for RFI mitigation to support QR sensor," Night Vision and Electronic Sensors Directorate, U.S. Army (DAAB15-00-D-1006/DO 0006), $66,000, 9/13/2002 – 9/12/2003. (Leslie Collins, PI)

[5] Co-Principal Investigator, "Software analysis/algorithm development for GSTAMIDS mine detection system," Night Vision and Electronic Sensors Directorate, U.S. Army (DAAB15-00-D-1006/DO 0004), $164,000, 2/22/2001 – 12/31/2002. (Leslie Collins, PI)

NATIONAL PROFESSIONAL SERVICE

Active Reviewer:

IEEE Transactions on Geoscience and Remote Sensing
Radio Science
IEEE Transactions on Signal Processing

PROFESSIONAL ACTIVITIES

Acoustical Society of America
Institute of Electrical and Electronic Engineers

HONORS AND AWARDS

Sigma Xi
Tau Beta Pi
Eta Kappa Nu
Omicron Delta Epsilon
Golden Key National Honor Society
Lt. Commander Robert James Manning Memorial Prize
National Merit Scholarship from PepsiCo Corporation

INVITED REFEREED JOURNAL PUBLICATIONS

[1] S. L. Tantum and L. M. Collins, "A comparison of algorithms for subsurface target detection and identification using time domain electromagnetic induction data," *IEEE Trans. Geoscience and Remote Sensing* special issue on New Advances in Subsurface Sensing: Systems, Modeling, and Signal Processing, **39**(6):1299–1306 (June 2001).

REFEREED JOURNAL PUBLICATIONS

[1] Y. Tan, S. L. Tantum, and L. M. Collins, "Kalman filtering for enhanced landmine detection using quadrupole resonance," *IEEE Trans. Geoscience and Remote Sensing*, **43**(7):1507–1516 (July 2005).

[2] W. Hu, S. L. Tantum, and L. M. Collins, "EMI-based classification of multiple closely-spaced subsurface objects via independent component analysis," *IEEE Trans. Geoscience and Remote Sensing*, **42**(11):2544–2554 (November 2004).

[3] Y. Tan, S. L. Tantum, and L. M. Collins, "Cramér–Rao lower bound for estimating quadrupole resonance signals in non-Gaussian noise," *IEEE Signal Processing Letters*, **11**(5):490–493 (May 2004).

[4] S. L. Tantum and L. M. Collins, "Performance bounds and a parameter transformation for decay rate estimation," *IEEE Trans. Geoscience and Remote Sensing* IGARSS 2002 special issue, **41**(10):2224–2231 (October 2003).

[5] Y. Tan, L. G. Huettel, S. L. Tantum, and L. M. Collins, "Enhanced auditory displays for improved landmine detection using EMI sensors," *Subsurface Sensing Technologies and Applications*, **4**(3):263–284 (July 2003).
[6] S. L. Tantum, L. W. Nolte, J. L. Krolik, and K. Harmancı, "The performance of matched-field track-before-detect methods using shallow-water Pacific data," *J. Acoustical Society of America*, **112**(1):119–127 (July 2002).
[7] S. L. Tantum and L. W. Nolte, "On array design for matched-field processing," *J. Acoustical Society of America*, **107**(4):2101–2111 (April 2000).
[8] S. L. Tantum and L. W. Nolte, "Tracking and localizing a moving source in an uncertain shallow water environment," *J. Acoustical Society of America*, **103**(1):362–373 (January 1998).

REFEREED JOURNAL PUBLICATIONS UNDER REVIEW

[1] S. L. Tantum, Y. Yu, and L. M. Collins, "An iterative approach to multi-modal sensor fusion exploiting feature-level information exchange," *IEEE Trans. Systems, Man, and Cybernetics, Part B – Cybernetics*, (submitted October 2005).
[2] C. S. Throckmorton, S. L. Tantum, Y. Tan, and L. M. Collins, "Blind Source Separation for UXO Detection in Highly Cluttered Environments," *Journal of Applied Geophysics* special issue on State-of-the-Art UXO Detection and Characterization, (submitted October 2005).

INVITED REFEREED CONFERENCE PROCEEDINGS

[1] L. Collins, P. Gao, and S. Tantum, "Model-based statistical signal processing using electromagnetic induction data for landmine detection and classification," *Proceedings of the 11th IEEE Workshop on Statistical Signal Processing*, 162–165. Singapore. August 6–8, 2001.

REFEREED CONFERENCE PROCEEDINGS

[1] Y. Tan, S. L. Tantum, and L. M. Collins, "UXO Discrimination Using Blind source Separation," *Proceedings of SAGEEP*, CD–ROM. 18^{th} Annual Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP), Atlanta, GA. April 3–7, 2005.
[2] Y. Tan, S. L. Tantum, and L. M. Collins, "Signal processing for improved explosives detection using quadrupole resonance," *Proceedings of SPIE Vol. 5415: Detection and Remediation Technologies for Mines and Minelike Targets IX*, 822–833. SPIE Defense and Security Syposium 2004, Orlando, FL. April 12–16, 2004.
[3] G. Borgonovi, D. T. Holslin, L. M. Collins, and S. L. Tantum, "Data analysis for classification of UXO filler using pulsed neutron techniques," *Proceedings of SPIE Vol. 5415: Detection and Remediation Technologies for Mines and Minelike Targets IX*, 502–509. SPIE Defense and Security Syposium 2004, Orlando, FL. April 12–16, 2004.
[4] S. L. Tantum, L. M. Collins, N. Khadr, and B. Barrow, "Correcting GPS measurement errors induced by system motion over uneven terrain," *Proceedings of SPIE Vol. 5089: Detection and Remediation Technologies for Mines and Minelike Targets VIII*, 1105–1115. AeroSense 2003 – International Symposium on Aerospace/Defense Sensing, Simulation, and Controls, Orlando, FL. April 21–25, 2003.
[5] Y. Tan, S. L. Tantum, and L. M. Collins, "Landmine detection with nuclear quadrupole resonance," *IGARSS 2002 Proceedings*, 1575–1578. 2002 IEEE International Geoscience and Remote Sensing Symposium, Toronto, Canada. June 24–28, 2002.
[6] S. L. Tantum and L. M. Collins, "A parameter transformation and Cramér–Rao lower bounds for estimating decay rates from exponential signals," *IGARSS 2002 Proceedings*, 2568–2571. 2002 IEEE International Geoscience and Remote Sensing Symposium, Toronto, Canada. June 24–28, 2002.
[7] S. L. Tantum, Y. Wei, V. S. Munshi, and L. M. Collins, "A comparison of algorithms for landmine detection and discrimination using ground penetrating radar," *Proceedings of SPIE Vol. 4742: Detection and Remediation Technologies for Mines and Minelike Targets VII*, 728–735. AeroSense 2002 – International Symposium on Aerospace/Defense Sensing, Simulation, and Controls, Orlando, FL. April 1–5, 2002.
[8] S. L. Tantum and L. M. Collins, "A parameter transformation for improved decay rate estimation," *Proceedings of SPIE Vol. 4742: Detection and Remediation Technologies for Mines and Minelike Targets VII*, 812–820. AeroSense 2002 – International Symposium on Aerospace/Defense Sensing, Simulation, and Controls, Orlando, FL. April 1–5, 2002.

[9] L. M. Collins, L. G. Huettel, W. A. Simpson, and S. L. Tantum, "Sensor fusion of EMI and GPR data for improved landmine detection," *Proceedings of SPIE Vol. 4742: Detection and Remediation Technologies for Mines and Minelike Targets VII*, 872–879. AeroSense 2002 – International Symposium on Aerospace/Defense Sensing, Simulation, and Controls, Orlando, FL. April 1–5, 2002.

[10] P. Chiang, S. L. Tantum, and L. M. Collins, "Signal processing of ground penetrating radar data for subsurface object detection," *Proceedings of SPIE Vol. 4394: Detection and Remediation Technologies for Mines and Minelike Targets VI*, 470–475. AeroSense 2001 – International Symposium on Aerospace/Defense Sensing, Simulation, and Controls, Orlando, FL. April 16–20, 2001.

[11] Y. Tan, S. L. Tantum, and L. M. Collins, "Enhanced signal and auditory processing for landmine detection using EMI sensors," *Proceedings of SPIE Vol. 4394: Detection and Remediation Technologies for Mines and Minelike Targets VI*, 852–858. AeroSense 2001 – International Symposium on Aerospace/Defense Sensing, Simulation, and Controls, Orlando, FL. April 16–20, 2001.

[12] S. L. Tantum and L. M. Collins, "Performance bounds for target identification using decay rate estimates from EMI measurements," *IGARSS 2000 Proceedings*, 2278–2280. 2000 IEEE International Geoscience and Remote Sensing Symposium, Honolulu, HI. July 24–28, 2000.

[13] S. Tantum and L. Collins, "Statistical signal processing for improved subsurface object detection and discrimination," *UXO/Countermine Forum 2000 Conference Proceedings*, CD-ROM. Anaheim, CA. May 2–5, 2000.

[14] L. Collins, Y. Zhang, J. Li, S. Tantum, and L. Carin, "Physics-based signal processing and sensor fusion for improved UXO detection," *UXO/Countermine Forum 2000 Conference Proceedings*, CD-ROM. Anaheim, CA. May 2–5, 2000.

[15] L. Collins, P. Gao, S. Tantum, J. Moulton, L. Makowsky, D. Reidy, and D. Weaver, "A comparison of statistical signal processing algorithms for detection and identification of low metal mines," *UXO/Countermine Forum 2000 Conference Proceedings*, CD-ROM. Anaheim, CA. May 2–5, 2000.

[16] L. M. Collins, S. L. Tantum, P. Gao, J. Moulton, L. Makowsky, D. Reidy, and R. Weaver, "Improving detection of low-metallic content landmines using EMI data," *Proceedings of SPIE Vol. 4038: Detection and Remediation Technologies for Mines and Minelike Targets V*, 14–24. AeroSense 2000 – International Symposium on Aerospace/Defense Sensing, Simulation, and Controls, Orlando, FL. April 24–28, 2000.

[17] S. L. Tantum and L. M. Collins, "Physics-based statistical signal processing for improved landmine detection and classification via decay rate estimation," *Proceedings of SPIE Vol. 4038: Detection and Remediation Technologies for Mines and Minelike Targets V*, 36–44. AeroSense 2000 – International Symposium on Aerospace/Defense Sensing, Simulation, and Controls, Orlando, FL. April 24–28, 2000.

[18] F. Liu, S. L. Tantum, L. M. Collins, and L. Carin, "Statistical signal processing for detection of buried landmines using quadrupole resonance," *Proceedings of SPIE Vol. 4038: Detection and Remediation Technologies for Mines and Minelike Targets V*, 572–577. AeroSense 2000 – International Symposium on Aerospace/Defense Sensing, Simulation, and Controls, Orlando, FL. April 24–28, 2000.

[19] S. L. Tantum and L. M. Collins, "Detection and classification of landmine-like targets in a non-Gaussian noise environment," *Proceedings of SPIE Vol. 4038: Detection and Remediation Technologies for Mines and Minelike Targets V*, 900–909. AeroSense 2000 – International Symposium on Aerospace/Defense Sensing, Simulation, and Controls, Orlando, FL. April 24–28, 2000.

[20] P. Gao, S. Tantum, L. Collins, D. Weaver, J. Moulton, L. Makowsky, and D. Reidy, "Statistical signal processing techniques for the detection of low-metal landmines using EMI and GPR sensors," *IGARSS '99 Proceedings*, 2465–2467. 1999 IEEE International Geoscience and Remote Sensing Symposium, Hamburg, Germany. June 28–July 2, 1999.

[21] S. Tantum, L. Collins, D. Reidy, and D. Weaver, "ATR algorithm performance for the BRTRC Wichmann ground penetrating radar system," *UXO Forum '99 Conference Proceedings*, CD-ROM. Atlanta, GA. May 25–27, 1999.

[22] S. L. Tantum, L. M. Collins, L. Carin, I. Gorodnitsky, A. D. Hibbs, D. O. Walsh, G. A. Barrell, D. Gregory, R. Matthews, and S. A. Vierkötter, "Signal processing for NQR discrimination of buried landmines," *Proceedings of SPIE Vol. 3710: Detection and Remediation Technologies for Mines and Minelike Targets IV*, 474–482. AeroSense 1999 – International Symposium on Aerospace/Defense Sensing, Simulation, and Controls, Orlando, FL. April 5–9, 1999.

[23] J. G. Rasimas, S. L. Tantum, and L. W. Nolte, "Bayesian signal detection for multiple aspect angles with an uncertain look angle," *Proceedings of SPIE Vol. 3710: Detection and Remediation Technologies for Mines and Minelike Targets IV*, 718–726. AeroSense 1999 – International Symposium on Aerospace/Defense Sensing, Simulation, and Controls, Orlando, FL. April 5–9, 1999.

[24] P. Gao, S. L. Tantum, and L. M. Collins, "Single sensor processing and sensor fusion of GPR and EMI data for landmine detection," *Proceedings of SPIE Vol. 3710: Detection and Remediation Technologies for Mines and Minelike Targets IV*, 1139–1148. AeroSense 1999 – International Symposium on Aerospace/Defense Sensing, Simulation, and Controls, Orlando, FL. April 5–9, 1999.

[25] S. L. Tantum and L. W. Nolte, "The effects of signal-to-noise ratio mismatch on Bayesian matched-field source localization performance," *ICASSP '99 Proceedings*, 2777–2780. 1999 IEEE International Conference on Acoustics, Speech, and Signal Processing, Phoenix, AZ. March 15–19, 1999.

[26] S. L. Tantum and L. W. Nolte, "Detection and tracking of a moving source with application to real data (SWellEX–3)," *Proceedings of the 16th International Congress on Acoustics and 135th Meeting of the Acoustical Society of America*, 639–640. Seattle, WA. June 22–26, 1998.

INVITED PRESENTATIONS

[1] L. W. Nolte, S. L. Tantum, and L. Sha, "Bayesian matched field tracking, depth classification, and environmental inversion in ocean acoustics." 6th International Conference on Theoretical and Computational Acoustics, Honolulu, HI. August 11–15, 2003.

[2] L. W. Nolte, S. L. Tantum, and L. Sha, "Incorporating uncertainty in ocean acoustics for optimum signal detection," *J. Acoustical Society of America*, **109**(5):2382(A) (May 2001). 141st Meeting of the Acoustical Society of America, special session on Signal Processing in Acoustics and Underwater Acoustics: Bayesian Signal Processing Approaches in Acoustics, Chicago, IL. June 4–8, 2001.

[3] L. Collins and S. Tantum, "ATR algorithm performance for the BRTRC Wichmann ground penetrating radar system." Joint UXO Coordination Office Ground Penetrating Radar Workshop. Institute for Defense Analyses, Alexandria, VA. June 8–10, 1999.

CONFERENCE ABSTRACTS AND PRESENTATIONS

[1] L. M. Collins, Y. Tan, S. L. Tantum, W. Hu, and L. Carin, "Statistical signal processing for UXO discrimination: Performance results for overlapping objects," Partners in Environmental Technology Symposium and Workshop, Washington, D.C. November 30–December 1, 2004.

[2] D. T. Holslin, G. Borgonovi, L. M. Collins, and S. L. Tantum, "Improved algorithms for UXO filler identification using pulsed neutron analysis techniques," Partners in Environmental Technology Symposium and Workshop, Washington, D.C. November 30–December 1, 2004.

[3] L. M. Collins, S. L. Tantum, Y. Tan, and L. Carin, "UXO discrimination on highly cluttered sites: A performance analysis," Partners in Environmental Technology Symposium and Workshop, Washington, D.C. November 30–December 1, 2004.

[4] L. S. Riggs, G. Sulzburger, S. Cash, C. Bryan, L. Stucker, L. M. Collins, and S. L. Tantum, "An evaluation of the GSTAMIDS metal detector array – Physical characteristics and signal processing considerations," AeroSense 2002 – International Symposium on Aerospace/Defense Sensing, Simulation, and Controls, Orlando, FL. April 1–5, 2002.

[5] S. Tantum and L. Collins, "Physics-based signal processing for subsurface object detection and identification using ground penetrating radar," UXO/Countermine Forum 2001, New Orleans, LA. April 9–12, 2001.

[6] S. L. Tantum and L. M. Collins, "Robust statistical signal processing for subsurface target detection and identification." URSI 2001 – National Radio Science Meeting, Boulder, CO. January 8–11, 2001.

[7] S. L. Tantum and L. M. Collins, "Bayesian statistical signal processing algorithms for subsurface target detection and identification," EuroEM 2000 – 5th Unexploded Ordnance Detection and Remediation Conference, Edinburgh, Scotland. May 30–June 2, 2000.

[8] L. M. Collins, P. Gao, S. L. Tantum, L. Makowsky, J. Cary, D. Reidy, J. Moulton, and R. Weaver, "Signal processing for low metal mine detection and identification: Results from a blind field test," EuroEM 2000 – 5^{th} Unexploded Ordnance Detection and Remediation Conference, Edinburgh, Scotland. May 30–June 2, 2000.

[9] S. L. Tantum and L. M. Collins, "Statistical signal processing for improved subsurface object detection and discrimination." URSI 2000 – National Radio Science Meeting, Boulder, CO. January 5–8, 2000.

[10] S. L. Tantum, L. W. Nolte, and M. T. Wazenski, "Optimal performance bounds for the classification of acoustic sources by depth in an oceanic waveguide," *J. Acoustical Society of America*, **104**(3):1809(A) (September 1998). 136th Meeting of the Acoustical Society of America, Norfolk, VA. October 12–16, 1998.

[11] S. L. Tantum, L. W. Nolte, and J. L. Krolik, "Matched-field source tracking with SWellEX–1 data," *J. Acoustical Society of America*, **101**(5):3046(A) (May 1997). 133rd Meeting of the Acoustical Society of America, State College, PA. June 15–20, 1997.

[12] S. L. Tantum and L. W. Nolte, "Optimal source tracking in an uncertain shallow water environment," *J. Acoustical Society of America*, **100**(4):2835(A) (October 1996). 3rd Joint Meeting of the Acoustical Society of America and the Acoustical Society of Japan, Honolulu, HI. December 2–6, 1996.

TEACHING EXPERIENCE

UNDERGRADUATE COURSES

"Fundamentals of Signal Processing and Communications," Junior/Senior level. (ECE 181, Duke)
"Introduction to Digital Communications," Junior/Senior level. (ECE 184, Duke)

GRADUATE COURSES

"Random Signals and Noise." (ECE 281, Duke)
"Digital Signal Processing." (ECE 282, Duke)

Ph.D. STUDENTS CURRENTLY UNDER SUPERVISION

Yuequan (Joy) Wang, "Signal processing for UXO detection using 3D sensors," expected May 2008, Co-Advisor. (Leslie Collins, Advisor.)

Yongli Yu, "Blind source separation for improved UXO detection in highly cluttered environments," expected May 2008, Co-Advisor. (Leslie Collins, Advisor)

Ph.D. STUDENTS SUPERVISED

Yingyi Tan, "Advanced signal processing in landmine detection with quadrupole resonance," May 2004, Co-Advisor. (Leslie Collins, Advisor.)

POST-DOCS SUPERVISED

Lei Huang, June 2005 – present, Co-Supervisor. (Leslie Collins, Supervisor.)

Yingyi Tan, May 2004 – December 2004, Co-Supervisor. (Leslie Collins, Supervisor.)

Yuchuan Wei, September 2001 – August 2002, Co-Supervisor. (Leslie Collins, Supervisor.)

UNDERGRADUATE RESEARCH PROJECTS SUPERVISED

Pei-Ju Chiang, "Signal processing of ground penetrating radar data for subsurface object detection," Spring 2001, Co-Advisor. (Leslie Collins, Advisor.)