

Yan Wu

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Department of Mathematical Sciences
Georgia Southern University
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Curriculum Vitae

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RESEARCH INTERESTS

Adaptive Control, Decentralized Control, Differential Algebraic Control Systems, Active Disturbance Rejection Control, Digital Filter Design, Sampling Theory, Speech Processing, Pharmacokinetics Models, Computed Tomography, Cancer Cell Modeling, Hydraulic Systems and Mechanisms

EDUCATIONAL DATA

University of Akron	Ph.D. (2000)	Applied Mathematics and Electrical Engineering
University of Akron	M.Sc. (1996)	Applied Mathematics
Beijing University of Technology	B.Sc. (1992)	Mathematics

PROFESSIONAL EXPERIENCE

2016-present	Associate Chair	Department of Mathematical Sciences
2012-present	Professor	Department of Mathematical Sciences
2011-present	Adjunct Research Professor	Department of Mechanical Engineering University of Manitoba
2007-2012	Graduate Program Director	Department of Mathematical Sciences
2006-2012	Associate Professor	Department of Mathematical Sciences
2000-2006	Assistant Professor	Department of Mathematical Sciences Georgia Southern University

PATENTS

“A Robust DSP Integrator for Accelerometer Signals” (with Dale H. Mugler), United States Patent Number 7130764, United States Patent and Trademark Office, October 31, 2006.
Licensed, Goodyear Polymer, January 6, 2009.

"Digital Accelerometer Samples Are Used in a New Way to Predict Future Velocity," (with Dale H. Mugler) United States Patent Number 6314327, United States Patent and Trademark Office, November 6, 2001. **Licensed**, Goodyear Polymer, January 6, 2009.

"DSP-Based Lossless Digital Encryption for Quantized Data", Pending.

REFEREED JOURNAL PUBLICATIONS

- Stabilizing the Lorenz Flows Using a Closed Loop Quotient Controller (with J. Braselton), *Open J. Applied Sciences*, v. 6, 560-578, 2016.
- Applying Linear Controls to Chaotic Continuous Dynamical Systems (with J. Braselton), *Open J. Applied Sciences*, v. 6, 141-152, 2016.
- Adsorption and Fraction of Suwannee River Organic Matter on Metal (Fe, Al) Oxide-Coated Quartz: A Liquid Chromatographic Investigation, (with D. I. Kreller, S. Sutton, and Anthony Furio), *Environmental Engineering Science*, v. 32 (1), p. 45-53, 2015. **doi: 10.1089/ees.2014.0294.**
- Discretization of Fractional Order Differentiator over Paley-Wiener Space, *Applied Mathematics and Computation*, v. 247, 162-168, 2014. **doi: 10.1016/j.amc.2014.08.089**
- Global Asymptotic Stability of Wavelet Network Adaptive Control of A Single-Loop Thermosyphon, *International Journal of Nonlinear Studies*, V. 20, No. 3, pp 321-329, 2013.
- Qualitative Properties of A System of Differential Equations Involving Kronecker Product of Matrices (with K. N. Murty, K. V. K. Viswanadh, P. Ramesh), *International Journal of Nonlinear Studies*, V. 20, No. 3, pp 459-467, 2013.
- Parametric Inverse of Severely Ill-Conditioned Hermitian Matrices in Signal Processing, *J. Frankl. Inst.*, v. 349, 1048-1060, 2012. **doi: 10.1016/j.jfranklin.2011.12.006**
- A Wavelet-Based Approach for On-line Internal Seal Damage Diagnosis in Hydraulic Actuators (with A. Yazdanpanah-Goharizi and Nariman Sepehri), *International Journal of Fluid Power*, v. 12 (2), 37-49, 2011.
- Metrics That Suit for Dichotomy, Well Conditioning and Object Oriented Design on Measure Chains (with K. N. Murty and V. Kanuri), *International Journal of Nonlinear Studies*, v. 18 (4), 2011.
- Adaptive Control of Linear Time Invariant Systems via a Wavelet Network and Applications to Control Lorenz Chaos (with J. S. Tanner), *Applied Mathematics and Computation*, v. 218, 22-31, 2011 (**doi: 10.1016/j.amc.2011.05.037**)
- Controllability and Observability of Matrix Differential Algebraic Equations, *International Journal of Circuits, Systems, and Signal Processing*, v. 5 (3), 287-296, 2011.

- Interpolation of Bandlimited Signals from Uniform or Non-uniform Integral Samples (with Nariman Sepehri), *Electron. Lett.*, 47 (1), 53-55, 2011 ([doi: 10.1049/el.2010.2183](https://doi.org/10.1049/el.2010.2183))
- A Full Row-Rank System Matrix Generated Along Two directions in Discrete Tomography (with X. Li, H. Wang, and J. Zhu), *Applied Mathematics and Computation*, v. 218, 107-114, 2011 ([doi: 10.1016/j.amc.2011.05.058](https://doi.org/10.1016/j.amc.2011.05.058))
- Suppressing the Chaotic Behavior of the Lorenz System with a Quotient Controller II: Global Stability Analysis (with Daniel C. Jones), *International Journal of Electronics, Computing, and Engineering Education*, v. 1 (2), 65-69, 2010.
- On the Eigen-structures of Functional K-Potent Matrices and Their Integral Forms (with Daniel F. Linder), *WSEAS Transactions on Mathematics*, 9 (4), 244-253, 2010.
- A Wavelet-Based Approach for Diagnosis of Internal Leakage in Hydraulic Actuators Using on-line Measurements (with A. Yazdanpanah-Goharizi and Nariman Sepehri), *International Journal of Fluid Power*, v. 11 (1), 61-70, 2010.
- On the Characteristic Polynomial of Regular Linear Matrix Pencil (with Phillip Lorren), *Alexandria Journal of Mathematics*, v. 1 (1), 53-60, 2010.
- Suppressing the Chaotic Behavior of the Lorenz System with a Quotient Controller I: Local Stability Analysis (with Daniel C. Jones), *International Journal of Electronics, Computing, and Engineering Education*, v. 1 (1), 1-4, 2010.
- Complete Identification of Permissible Sampling Rates for the First-Order Sampling of Multi-Band Bandpass Signals (with Daniel F. Linder), *WSEAS Transactions on Mathematics*, v. 8 (8), 383-392, 2009.
- A Closed Form Solution for An Unorthodox Trigonometric Integral, *International Journal of Mathematical Education in Science and Technology*, v. 40 (6), 814-817, 2009 ([doi:10.1080/00207390902826573](https://doi.org/10.1080/00207390902826573))
- A Proof on the Minimum and Permissible Sampling Rates for the First-Order Sampling of Bandpass Signals, *Digital Signal Processing*, v. 17 (4), 848-854, 2007.
- Improved Second Derivative Test for Relative Extrema, *International Journal of Mathematical Education in Science and Technology*, v. 38 (8), 1121-1123, 2007.
- On the Design of an Array of Subband Predictive Filters for Bandlimited Signals, *WSEAS Transactions on Signal Processing*, v. 2 (11), 1441-1447, 2006.
- Fundamental Theory of Control of General First-order Matrix Difference Systems (Kanuri N. Murty and Laurene V. Fausett), *Dynamics of Continuous, Discrete and Impulsive Systems, A: Mathematical Analysis*, v. 13 (2), 301-308, 2006.
- Stability Analysis of the Bandlimited and Bandpassed Linear Prediction Models, *Journal of Circuits, Systems, and Computers*, v. 14 (5), 1007-1014, 2005.

- A Universal Interpolative Filter for Low-pass And Bandpass Signals-CSINC Interpolator, *Digital Signal Processing*, v. 15 (5), 425-436, 2005.
- Ranked 4th place in DSP's Top25 publications in 2005.
http://top25.sciencedirect.com/index.php?cat_id=5&subject_area_id=7&journal_id=10512004
- A Robust DSP Integrator for Accelerometer Signals (with Dale H. Mugler), *IEEE Transactions on Biomedical Engineering*, v. 51 (2), 385-389, 2004.
- On the Positiveness of A Functional Symmetric Matrix Used in Digital Filter Design, *Journal of Circuits, Systems, and Computers*, v. 13 (5), 1105-1110, 2004.
- An Integrator for Time-Dependent Systems with Oscillatory Behavior (with Dale H. Mugler), *Computer Methods in Applied Mechanics and Engineering*, v. 171, 25-41, 1999.

REFEREED PROCEEDINGS PAPERS AND BOOK CHAPTERS

- On the Modeling and Control of Coupled Multi-Loop Thermosyphons, *Proc. 2011 American Conference on Applied Mathematics*, Puerto Morelos, Mexico, 2011, 105-110.
- K-Potent Matrices-Construction and Applications in Digital Image Encryption, *Proc. 2010 American conference on Applied mathematics*, Harvard University, Cambridge, MA, 2010, 455-460.
- Internal Leakage Diagnosis in Hydraulic Actuators Using Wavelet Transforms (with Amin F. Goharrizi and Nariman Sepehri), *Proc. ASME 2009 Dynamic Systems and Control Conference (DSCC2009)*, v. 2, CA, 2009, 17-23. ([doi:10.1115/DSCC2009-2635](https://doi.org/10.1115/DSCC2009-2635))
- Sampling Rates for the First-Order Sampling of Two-Band Signals (with Daniel F. Linder), *Proc. 9th International Conference on Multimedia, Systems, & Signal Processing*, Hangzhou, China, 2009, 123-126.
- An Anti-Symmetric Key Algorithm for Signal Encryption (with A. C. Vosler), *Proc. 6th International Conference on Signal Processing*, Dallas, TX, 2007, 140-145.
- Linear Subband Predictive Filters for Wideband Signals, *Proc. of the 5th International Conference on Circuits, Systems, Electronics, Control & Signal Processing*, Dallas, TX, 2006, 128-133.
- Discrete Hermite Expansion of Digital Signals: Applications to ECG Signals (with Dale H. Mugler and Stewart G. Clary), *Proc. 10th IEEE International Digital Signal Processing Workshop*, 2002, 271-276.
- Stability Analysis of Wavelet-Based Controller Design (with Robert J. Veillette, Dale H. Mugler, and Tom T. Hartley), *Proc 2001 American Control Conference*, Washington, D.C., v. 6, 2001, 4826--4827.

- Prediction of Bandlimited Signals from Past Samples and Applications to Speech Coding, Chapter 13, *Nonuniform Sampling: Theory and Practice* (with Dale H. Mugler), pp 543--584, Plenum Publishers, 2001.
- Linear Prediction for Bandpass Signals Based On Nonuniform Past Samples (with Dale H. Mugler and Stewart G. Clary), *Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing*, v. 6, 2000, 3854-3857.
- Nyquist Rates and the Linear Prediction of Band-limited Signals Based on Signal and Derivative Samples (with Dale H. Mugle and Splettstßer), *Proc. of International Workshop on Sampling Theory and Applications*, Portugal, 1997, 321-326.
- Linear Prediction of Band-limited Signals from Signal and Derivative Samples (with Dale H. Mugler), *Proc IASTED Signal and Image Processing*, v. SIP-96, 1996, 18-22.

RESEARCH GRANTS

- NSERC/MCI Research Grant, \$1.03 Million

Co-I, "Innovative Design of High Precision Sensors to Reduce Emissions, Improve Safety, and Facilitate New Designs and Analysis for Heavy Ground Vehicles" (with C. Q. Wu, Y. Luo, O. Ojo, L. Wang, H. Ye), funding period: 2013-2018.

- "Development of a Mathematical Tool for Accelerated Durability Tests of Ground Vehicles," (with C. Q. Wu, A. Q. Wang, A. B. Gumel, L. Wang, and E. Esmailzadeh), MITACS Research Grant, MITACS Inc., Canada, July 1, 2009 to June 1, 2011, \$186,660.
- Georgia Southern Faculty Research Grants, \$9860.

SELECTED PRESENTATIONS (INVITED)

- The Seventh International Conference on Dynamical Systems and Applications, May 27-30, 2015, Morehouse College and Center for the Theoretical Studies of Physical Systems, Atlanta, Georgia.
- The 2015 AMMCS-CAIMS (Applied Mathematics, Modeling, and Computational Science, Canadian Applied and Industrial Society) congress, June 7-12, 2015, Waterloo, ON, Canada.
- The 2013 International Conference on Applied Mathematics, Modeling, and Computational Science (AMMCS-2013), August 26-30, 2013, Waterloo, Ontario, Canada.

- Colloquium, The Hudson Colloquium series, Armstrong Atlantic State University, Savannah, GA, January 22, 2012.
- Colloquium, College of Mathematics and Statistics, Huazhong Normal University, Wuhan, China, March 21, 2012.
- Colloquium, Department of Electrical Engineering, Embry-Riddle Aeronautical University, Daytona Beach, FL, April 26, 2011
- 2011 American Conference on Applied Mathematics, Puerto Morelos, Mexico, January 29-31, 2011.
- Colloquium, CST Colloquium series, Armstrong Atlantic State University, Savannah, GA, January 19, 2011.
- 2010 American Conference on Applied Mathematics, Harvard University, Cambridge, MA, January 27-29, 2010.
- Special Session on Computational and Applied Mathematics, AMS Southeastern Section Meeting, University of Richmond, Richmond, VA, November 6-7, 2010.
- Plenary speaker, International Conference on Robotics, Control, and Manufacturing Technology, Zhejiang University of Technology, Zhejiang, China, May 20-22, 2009.
- International Conference on Multimedia Systems & Signal Processing, China Jiliang University, Zhejiang, China, May 20-22, 2009.
- (45-minute talk) Fifth World Congress of Nonlinear Analysts, Orlando, FL, July 2-9, 2008.
- The 6th International Conference on Signal Processing, Dallas, TX, March 22-24, 2007.
- The 5th International Conference on Circuits, Systems, Electronics, Control, and Signal Processing, Dallas, TX, November 1-3, 2006.

STUDENT DEVELOPMENT

Undergraduate Research:

- Mark Davis, double major in Applied Mathematics and Electrical Engineering, “Algorithms for generating fractional derivatives of bandlimited functions via Fourier integral”, in progress.

- Phillip Lorren, “Developing a Symbolic Algorithm for Calculating the Eigenvalues of a Regular Matrix Pencil”, Capstone Project, presented at the Honors Research Symposium, April 28, 2010.
- Daniel Linder, “Spectral Properties of Idempotent and Nilpotent Matrices and Applications in DAEs,” presented at the Mathematical Association of America MathFest 2006, Knoxville, TN, August 10, 2006.
- Ann Catherine Vosler, “Construction of an Integral Matrix with an Integral Inverse,” Capstone Project, presented at Phi Kappa Phi Research Symposium, April 16, 2004.

Graduate Research:

- Zachery Espe, “ADRC control applied to Lorenz systems with uncertainties”, in progress.
- Anh Tran, “Adaptive state feedback control of Lorenz systems to its non-trivial equilibrium”, May, 2014

Ph.D. Student at Georgia Institute of Technology

- Adrian Joseph, “Computation of Lyapunov exponents and control of a hyper-chaotic system”
- Sippapas SiriJatuphat, “Design of FIR Low-Pass Digital Differentiators for Signals in Paley Wiener Space” May 2010

Ph.D. student at University of Tennessee

- Daniel C Jones, “Stability Analysis of the Chaotic Lorenz System with a State-Feedback Controller,” June 2009.

Visiting scholar at British Antarctic Survey, Cambridge, UK

- Daniel F. Linder, “Optimal and Permissible Sampling Rates for the First-Order Sampling of Two-Band Passband Signals,” May 2008.

Tenure-track faculty at Georgia Southern University

- Jonathan S. Tanner, “State Feedback Control of A Single-Loop Thermosyphon System via A Quotient Controller,” May 2007

Control Engineer, Gulfstream Aerospace Corporation, Savannah, GA.

PROFESSIONAL SERVICE

- **Editor-in-Chief** , International Journal of Electronics Computing and Engineering Education
- **Associate Editor**, Instrumentation, Systems, and Automation (ISA), Associate Editor for American Automatic Control Council (AACC), International Journal of Electronics, Computing, and Engineering Education
- **Reviewer** for Mathematical Reviews, Journal of Mathematical Analysis and Applications, IEEE Transactions on Automatic Control, International Journal of Intelligent Control and systems, Neural, Parallel, and Scientific Computations, IEEE Transactions on Biomedical Engineering, International Journal of Modeling and Simulation, Journal of Engineering Simulation (Russian and Ukrainian National Academic of Sciences), Journal of Applied Mathematics and Computation, Journal of The Franklin Institute, IEE Proceedings on Control Theory and Applications, IEEE Transactions on Fuzzy Systems, Digital Signal Processing, IEEE Proceedings of Decision and Control, Journal of Pattern Recognition Letters, Journal of Applied Mathematics and Computing
- **Reviewer and Panelist-** National Science Foundation
- **Conference organization**

Co-Chaired a special session in Differential Equations and Applications II at the International Conference on Dynamical Systems and Applications, Morehouse, Atlanta, May 27-30, 2015.

Chair, special session on “Control Systems and Signal Processing,” AMS Southeastern Section Meeting, Statesboro, GA, March 13-14, 2011.

Co-Chair, special session on “Computational and Applied Mathematics,” AMS 2011 Fall Central Meeting, Lincoln, NE, October, 14-16, 2011

Member of the International Program Committee for IEEE Conference on Control Applications, Toronto, Canada, sponsored by the IEEE Control Systems Society, August 28-31, 2005.

Member of the International Program Committee for MATH-CSECS-COMPUCHEM, Cairo, Egypt, December 29-31, 2007.

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Institute of Electrical and Electronics Engineers (IEEE), *member*
Mathematical Association of America (MAA)
American Mathematical Society (AMS)