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# *Mark J. Paulik*

## W o r k :

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## **SELECTED EXPERIENCE**

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### ***Professor of Electrical and Computer Engineering University of Detroit Mercy***

***August 2001 - Present***

- Chair, Department of Electrical and Computer Engineering: Responsible for all department faculty and student affairs, budget, and development. August 2007-present.
- Chair, University Strategic Planning Team: Responsible for developing and reviewing planning documents for the university strategic plan, October 2005-January 2008.
- Chair, ECE Department Curriculum Committee: Directed the complete redesign and implementation of a new and innovative undergraduate ECE curriculum. The new program is characterized by a Spiral topical structure, Enquiry-Based-Learning (EBL) studio design projects, and a motivational multi-year project structure.
  - Principal Investigator "A Balanced, Integrated, and Innovative Electrical and Computer Engineering Curriculum," Submitted to the NSF, Implementation Grants for the Department-Level Reform of Undergraduate Engineering Education initiative, \$1,000,000: (Recommended for Funding: Proposal No. 0530298 -- not funded - insufficient funds), Summer 2005. Grant included in-kind support from FORD PAS program and Utica MI School District.
  - Principal Investigator "Development of an Innovative Curriculum for Undergraduate Electrical and Computer Engineering Students" NSF, Planning Grants for the Department-Level Reform of Undergraduate Engineering Education initiative, \$100,000. (Recommended for Funding: Proposal No. 0230602 -- funded, 2003-2005).
  - Participated in development of Interdisciplinary (Mechanical and Electrical Engineering) graduate Mechatronics specialization 2002-2004.
  - Developed Undergraduate Computer Engineering specialization program 2001-2004, 2006.
  - Designed and taught 7 new courses in embedded systems and design; participated in creation of 4 additional new courses in ECE (fundamentals I&II, systems, electronics) in support of new Spiral curriculum.
- Co-director in the development of the Advanced Mobility Lab (AML) for autonomous robotics at UDM; PI and Co-PI for grants with TARDEC/ARO-Battelle; \$970,000. Topics investigated: Multi-UGV cooperative mapping and navigation, systems-level reliability and requirements cascading analysis, wireless vehicle sensor networks, and fault diagnosis and prognosis for vehicular health monitoring.
- Developed Interdisciplinary (Mech. Eng. and ECE) two-semester Capstone Design Sequence based on autonomous ground vehicle development for competition in the International Ground Vehicle Competition (IGVC) 2003-2007 (with Drs. Krishnan and Rayess):

- Winner Third Place Overall 2006 IGVC
- Winner Sixth Place Autonomous Challenge Competition 2005 IGVC
- Best Student Paper Award: SPIE Optics East, "Lane Identification and Path Planning for Autonomous Mobile Robots," Robert T. McKeon, Mark Paulik, and Mohan Krishnan, Boston, MA, October 2006
- Directed Department Design program development 1990-2007:
  - IEEE Best paper award, Transactions on Education -- paper describes design program evolution, 2001.
  - Developed Freshman design course modules (mechatronics) 2003-06.
  - Introduced coordinated robotic systems design projects in Sophomore, Junior and Senior years 2005-2007.
- Member, University Faculty Assembly (elected) 2005 & 2007 (inaugural shared governance body)
- Member, University Core Curriculum Committee, 1994-2002 -- developed process plan for Core re-design, 2002.
- Keynote speaker on new educational paradigms, College Counselors breakfast, April 6, 2005
- ABET: A principal author and editor for the complete, 2004 ECE ABET volume II documents
- Developed/directed multimedia program marketing materials (CD and brochure) for presentation of our new integrated curriculum initiative (ECE) 2006-2007.
- Member of ECE Department Doctoral Review Committee (2001-2007)
- Department Lab Equipment Budget and Purchase Coordinator 2000-2007

***Associate Professor of Electrical and Computer Engineering  
University of Detroit Mercy***

***August 1992 - August 2001***

- Chair/Facilitator, University Future of Computing Committee; Co-author of the University Information Technology Vision statement, 2001
- Principal author and editor Department of ECE undergraduate and graduate program prioritization reports (University benchmark and quality assessment review process) 2001
- Represented UDM at the 2<sup>nd</sup> national conference on Jesuit school core curricula 2001.
- ABET: A principal author and editor for the complete, 1998 ECE ABET volume II documents
- Chair and member of the College of Engineering and Science Promotion and Tenure Committee 1995-2001 (chair for 3 years)
- Member of the University Computing Committee 1991-1998
- Member of the College Faculty Grants and Incentives Program Committee 1995-2001

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**ADDITIONAL ACADEMIC AND INDUSTRIAL EXPERIENCE**

***Assistant Professor of Electrical and Computer Engineering  
University of Detroit Mercy***

***August 1989 - August 1992***

***Associate Engineer, Advanced Product Engineering, Product Engineering  
General Motors / Delphi Division, Flint MI (full-time, leave and consultation 85-89)***

***May 1981 - Aug 1989***

***Instructor of Electrical Engineering  
University of Detroit***

***August 1984 - May 1986***

***GM Scholar - Cooperative Education Student  
General Motors AC Spark Plug Division, Flint MI***

***May 1978 - May 1981***

## ACADEMIC PREPARATION

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- Doctor of Philosophy, Electrical and Systems Engineering June 1989  
Oakland University; Rochester, Michigan  
Major Field: Digital Signal and Image Processing  
Minor Field: Optimization  
Dissertation Title: Analysis and Classification of Planar Shapes and Textures Using Stationary and Nonstationary Autoregressive Models
- Science Masters, Electrical Engineering June 1983  
Massachusetts Institute of Technology; Cambridge, MA  
Major Field: Digital Signal Processing  
Minor Field: Embedded Systems  
Thesis Title: The Separation of Acoustically Added Speech Signals by Adaptive Noise Canceling
- Bachelor of Electrical Engineering May 1981  
University of Detroit; Detroit, Michigan

## AWARDS AND HONORS

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- 🏆 Best Student Paper Award: SPIE Optics East, "Lane Identification and Path Planning for Autonomous Mobile Robots," Robert T. McKeon, Mark Paulik, and Mohan Krishnan, Boston, MA, October 2006
- 🏆 Invited: NSF Department Level Reform Review Panel, Washington D.C., April 15-16, 2004.
- 🏆 Best Paper award: IEEE Education Society, IEEE Transactions on Education, "A Competition-Motivated Capstone Design Course: The Result of a Fifteen-Year Evolution", IEEE Transactions on Education, April 2001, Award announced IEEE FIE 2002, Nov. 2002
- 🏆 Awarded Sabbatical leave (2002-03, II): Embedded systems curriculum development: SoCs and Real time systems.
- 🏆 Nominated for Whos Who Among Americas Teachers, 2000.
- 🏆 Elevated to Senior Member of the Institute of Electrical and Electronic Engineers, 2000.
- 🏆 NSF Outstanding Lecturer award: NSF sponsored Applied Optics course, Oakland University, 1995
- 🏆 Elected Chairman IEEE Southeastern MI Signal Processing and Circuits and Systems Chapters, 1993.
- 🏆 Recipient of the most improved Chapter Award - IEEE Southeastern MI Signal Processing and Circuits and Systems Chapters, 1993
- 🏆 Elected Chairman IEEE Southeastern MI Signal Processing and Circuits and Systems Chapters, 1992.
- 🏆 Four times nominated for the Engineering Teacher of the Year award.
- 🏆 Elected Vice-Chairman IEEE Southeastern MI Signal Processing and Circuits and Systems Societies, 1991.
- 🏆 Doctoral Qualification with Honors: Digital Signal Processing, Optimization, Mathematics, 1987
- 🏆 Oakland University Provost's Full Fellowship, 1986-1989
- 🏆 General Motors Fellow: graduate studies MIT (Full Fellowship), 1981-1983
- 🏆 National Merit Letter of Commendation (NSF), 1981
- 🏆 Engineer of the Year Award, University of Detroit, 1981
- 🏆 General Motors Full Undergraduate Scholarship 1977-1981

## TEACHING INTERESTS

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- Engineering Design/Product Development
- Image and Signal Processing
- Embedded systems, FPGAs, VHDL
- Signals and Systems

## RESEARCH INTERESTS

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- Autonomous robotic vehicle development including vision, localization, navigation and control
- Pedagogy: Enquiry and Problem Based Learning; Curriculum design: contextual, motivational, innovation science-based design and development
- Fault diagnostics: computational intelligence (neural nets, genetic algorithms)
- Image and Signature modeling and classification: adaptive, parametric, wavelets
- Real Time Embedded systems: Microcontrollers, DSPs, SoCs

## PROPOSALS AND GRANTS

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"Cooperative Multi-UGV Mapping and Navigation", PI, Mohan Krishnan and Nizar Al-Holou Co-PIs, TARDEC/ARO Battelle: \$ 100,000, funded 2007-08.

"Supplemental funding 2007-08: Next Generation Vehicle Network and Sensors for Vehicle Reliability", Co-PI with Nizar Al-Holou and Mohan Krishnan, TARDEC/ARO Battelle: \$100,000 (supplemental to existing contract TCN 06164).

"Developing and Implementing Innovative Curricula", PI, Mohan Krishnan Co-Pi, Denso Corporation, funded for \$17,500. Funds have been designated for support of the ECE Dept's new Advanced Mobility Lab (AML), 2007-08.

"Next Generation Vehicle Network and Sensors for Vehicle Reliability", Co-PI, with Nizar Al-Holou and Mohan Krishnan, Tank Automotive Research Development and Engineering Center (TARDEC) / Battelle, \$385,400 October 2006 -- October 2008

"A Balanced, Integrated, and Innovative Electrical and Computer Engineering Curriculum," Mark Paulik (PI), Mohan Krishnan, Sandra Yost, Nizar Al-Holou (Co-PIs), Submitted to the NSF, Planning Grants for the Department-Level Reform of Undergraduate Engineering Education initiative, \$1,000,000: (Recommended for Funding Proposal No.-0530298, not funded -- insufficient funds), 2005

"Development of an Innovative Curriculum for Undergraduate Electrical and Computer Engineering Students", Mark Paulik (PI), Mohan Krishnan & Nizar Al-Holou (Co-PIs), NSF, Planning Grants for the Department-Level Reform of Undergraduate Engineering Education initiative, \$100,000, funded, 2003-2005

Daimler Chrysler Corporation, 2000-2008 Co-PI: Dr. M.J. Paulik with Dr. Mohan Krishnan, "A Real Time DSP Applications Laboratory," \$43,200

Daimler Chrysler Corporation, 1996-2008 Co-PI: Dr. M.J. Paulik with Dr. Mohan Krishnan, "Enhancement of the EE Capstone Design Course Sequence," \$78,000

Altera, University Grant Program, PI: Dr. Mark J. Paulik, "Undergraduate FPGA laboratory instruction using VHDL Phase IV," Development System Hardware and Licensing, \$18,000, 2006

Altera, University Grant Program, PI: Dr. Mark J. Paulik, "Undergraduate FPGA laboratory instruction using VHDL Phase III," Software Licensing, and Hardware \$5000, 2002

Altera, University Grant Program, PI: Dr. M.J. Paulik, "Undergraduate FPGA laboratory instruction using VHDL Phase II," \$38,000 Software Licensing, and \$11,000 Hardware, 1999

National Instruments Academic Partnership Program, 1999, Co-PI with Dr. Mohan Krishnan, "Autonomous Ground Vehicle Development," \$11,200 Hardware and Software

Altera, University Grant Program, January 1997-1998, Co-PI with Dr. N. Al-Holou, "Undergraduate FPGA laboratory instruction using VHDL," \$4500 Equipment and Software

Amigo International, October 1998 PI: Dr. Mark J. Paulik, "Autonomous Ground Vehicle Development," \$4000 Vehicle Platform

"Undergraduate ASIC Computer-Aided Design Laboratory," NSF, CCLI program, Co-PI with Dr. N. Al-Holou, \$56,456, 1996

"Automatic Target Recognition and Tracking (ATTRACT)," Wright Patterson Air Force Base, PI: Dr. Nizar Al-Holou, Investigator: Dr. Mark J. Paulik, \$58,000, 1995-1996

"A Passive Entry System for Automotive Applications," Ford Motor Company, PI: Dr. M. Paulik, Investigator: Dr. C.J. Lin, \$40,000, Oct. 1993-May 1995

"Development of A Plastic Optical Fibre Communication Link for Automotive Applications," Ford Motor Company, Oct. 1993-May 1995, PI: Dr. N. Al-Holou, Investigators: Dr. Mohan Krishnan and Dr. M. Paulik, \$40,000, Oct. 1993- May 1995

"Senior Design Laboratory Equipment Proposal," Hewlett Packard Company, University Grants Program, PI: Mark Paulik, \$5950.00, July 1991

"Handwriting Recognition Using a Nonstationary Autoregressive Hidden Markov Model," Federal Mogul Faculty Professional Development Program, Co-PIs M.J. Paulik and Dr. Mohankrishnan, \$1200.00, 1991

"Automotive Electronics Laboratory Development," Ford Motor Company, \$400,000.00, PI, Co-PIs: Deans James Kent, Arthur Haman, and Dr. Dipak Sengupta

"Object Boundary Modeling and Analysis," Federal Mogul Faculty Professional Development Program, PI: Mark Paulik, \$3500.00, 1990

"Control System Component Reliability," Ford Motor Company, Transmission and Chassis Division, Co-PIs Drs. Ashfrazadeh, Lin, Mohankrishnan, Sengupta, Investigator: Mark J. Paulik, \$140,000.00, 1989-1990

## **PUBLICATIONS**

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### Refereed Journals and National/International Conference Publications:

"Articulated and Morphing Unmanned Ground Vehicles Controlled with Complimentary Semi- & Autonomous Mobility Behaviors", Jerry Lane, Charles Reinholtz, Sean Baity, Andrew Poulter, Mohan Krishnan, Mark Paulik, and Nassif Rayess, accepted for publication: NATO Symposium on Platform Innovations and System Integration for Unmanned Air, Land and Sea Vehicles", Florence, Italy, May 2007

Tarig A. Osman, Mark J. Paulik and N. Mohankrishnan, "An Online Signature Verification System based on Multivariate Autoregressive Modeling and DTW Segmentation," IEEE SAFE 2007: Signal Processing Applications for Public Security and Forensics, Washington D.C., April 2007

Mohan Krishnan, Mark J. Paulik, and Nassif Rayess, "A Multi-Disciplinary and Multi-Cultural Competition-Based Capstone Design Program," Proceedings of the IEEE/ASEE FIE 2007 Conference, Milwaukee WI, October 10-13, 2007

Mark J. Paulik and Mohan Krishnan, "A Project-Based Spiral Curriculum Incorporating Modern Teaching Paradigms," 5th Annual ASEE Global Colloquium on Engineering Education, Rio de Janeiro, Brazil, October 2006

Faroog Ibrahim, Tom Pilutti, Nizar AlHolou, Mark Paulik, "Accurate INS Position Solution During GPS Outages or Degraded GPS," Journal of Vehicle System Dynamics, Vol. 43, No.9, September 2005, pp. 633-652

Tom Stoltz, Mark Paulik, N. Al-Holou, "A Microcontroller Laboratory Hardware Platform for the Academic Environment," IEEE/ASEE Frontiers in Education Conference, October 2005, Indianapolis, Indiana

Mark Paulik, Mohan Krishnan, and Nizar Al-Holou, "Development of an Innovative Curriculum for Undergraduate Electrical and Computer Engineering Students", IEEE/ASEE Frontiers in Education Conference, October 2004, Savannah, GA

Mohan Krishnan, Shuvra Das, Mark Paulik et. al., "Assessment: When is Enough Enough?," IEEE/ASEE Frontiers in Education Conference, November 5-8, 2003, Boulder, CO

Prasad Venugopal, Mark Paulik and Mohan Krishnan, "EE Capstone Design Projects: Developing Computer-Based Laboratories For Introductory Physics", IEEE/ASEE Frontiers in Education Conference, Nov. 2002, Boston, MA

Mark Paulik and Mohan Krishnan, "A Competition Motivated Capstone Design Course: The Result of a Fifteen Year Evolution," IEEE Transactions on Education, vol 4., no 1., pp. 67-75, February 2001

Mark Paulik, Mohan Krishnan, "An Autonomous Ground Vehicle Competition-Driven Capstone Design Course," Proceedings of the IEEE International Conference on the Frontiers in Education Conference, San Juan, Puerto Rico, November, 1999

Mohan Krishnan, Wan-Suck Lee, Mark Paulik, "A Performance Evaluation of a New Signature Verification Algorithm Using Realistic Forgeries," IEEE International Conference on Image Processing, Japan, November 1999

Farooq Ibrahim, Tom Pilutti, Nizar AlHolou, Mark Paulik, "Accurate Gap Filling Using Properly Initialized INS During Periods of GPS Signal Blockage," Proceedings of the Institute of Navigation (ION) Conference, Nashville, September 14-17, 1999

Farooq Ibrahim, Tom Pilutti, Nizar AlHolou, Mark Paulik, "Estimating Biases and Scale Factors in Speed and Yaw Rate Sensors Using a Linear Neuron," Proceedings of the Institute of Navigation (ION) Conference, Nashville, September 14-17, 1999

M. J. Paulik, Yung-Da Wang, "Three-Dimensional Object Recognition Using Vector Wavelets," Proceedings of the IEEE International Conference on Image Processing, Chicago Ill, October 1998

Wan-Suck Lee, Mohan Krishnan, and M. J. Paulik, "Improved Segmentation Through Dynamic Time Warping for Signature Verification Using a Neural Network," Proceedings of the IEEE International Conference on Image Processing, Chicago Ill, October 1998

M. J. Paulik, and Mohan Krishnan, "Teaching Electrical Engineering Design: A Ten Year Summary," Proceedings of the IEEE International Conference on the Frontiers of Education, San Jose, CA, November 1994

N. Mohankrishnan and M. J. Paulik, "On-line Signature Verification Using a Nonstationary Autoregressive Model Representation," 1993 International Symposium on Circuits and Systems, Chicago Ill, May 3-6, 1993

M. J. Paulik, M. Das, and N. K. Loh, "Nonstationary Autoregressive Modeling of Object Contours," IEEE Transactions on Acoustics, Speech, and Signal Processing, Vol. 40, No. 3, March 1992, pp. 660-675

M. J. Paulik and N. Mohankrishnan, "Shape Recognition Using a Nonstationary Autoregressive Hidden Markov Model," Proceedings of the International Conference on Acoustics, Speech and Signal Processing, Toronto Ontario, May 14-17, 1991

M. J. Paulik and M. Das, "Modeling of Random Natural Textures Using a Spatially Variant Multiplicative Autoregressive Model," IEEE International Conference on Systems Engineering, August 9-11, 1990, Pittsburgh PA

M. Das, M. J. Paulik, and N. K. Loh, "A Bivariate Autoregressive Modeling Technique for Analysis and Classification of Planar Shapes," IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 12, No. 1, pp. 97-103, January 1990

M. J. Paulik, M. Das and N. K. Loh, "Analysis and Classification of Planar Shapes Using Spatially Varying Autoregressive Models," IEEE International Symposium on Circuits and Systems, Portland, Oregon, May 9-11, 1989

M. Das, M. J. Paulik, and N. K. Loh, "A Projection Based Constrained Optimization Technique for One Shot Optimal Design of Stable 1-D and Separable 2-D IIR Filters," Proceedings of the International Conference on Acoustics, Speech, & Signal Processing, Dallas Texas, April 1987

#### Refereed Regional Conference Publications:

Robert T. McKeon, Mark Paulik, and Mohan Krishnan, "Lane Identification and Path Planning for Autonomous Mobile Robots," SPIE Optics East 2006, Boston, MA, October 2006

Robert T. McKeon, Mohan Krishnan, and Mark Paulik, "Obstacle Recognition Using Region-Based Color

Segmentation Techniques for Mobile Robot Navigation", SPIE Optics East 2006, Boston, MA, October 2006

M. J. Paulik, Yung-Da Wang, "A Multiwavelet Model for 2-D Object Analysis and Classification," Proceedings of the IEEE Midwest Symposium on Circuits and Systems, Notre Dame IN, August 1998

M. J. Paulik, Mohan Krishnan, and M. Nikiforuk, "Dynamic Stochastic Segmentation of On-Line Signature Contours," Proceedings of the IEEE Midwest Symposium on Circuits and Systems, Iowa , August 1996

Yung-Da Wang, M. J. Paulik, "A Discrete Wavelet Model for Target Recognition," Proceedings of the IEEE Midwest Symposium on Circuits and Systems, Iowa , August 1996

Mohan Krishnan, Wan-Suck Lee, and M. J. Paulik, "Multi-layer Neural Network Classification of On-Line 1-D Signature Contours," Proceedings of the IEEE Midwest Symposium on Circuits and Systems, Iowa , August 1996

Mark J. Paulik, N. Mohankrishnan, and Micheal Nikiforuk , "A TimeVarying Vector Autoregressive Model for Signature Verification". Proceedings of the IEEE Midwest Symposium on Circuits and Systems, Lafayette, Louisiana , August 1994

N. Mohankrishnan, Mark J. Paulik, and Mohamad Khalil, "Impact of Forgeries on the Performance of an Online ModelBased Signature Verification System". Proceedings of the IEEE Midwest Symposium on Circuits and Systems, Lafayette, Louisiana , August 1994

M. J. Paulik and N. Mohankrishnan, "A 1-D Decomposition Based Autoregressive Hidden Markov Model for Dynamic Signature Identification and Verification," IEEE Midwest Symposium on Circuits and Systems, Detroit Michigan, August 1993

N. Mohankrishnan, M. J. Paulik, and M. Khalil, "Issues Pertaining to Optimal Performance of an On-line Autoregressive Model Based Signature Verification System," IEEE Midwest Symposium on Circuits and Systems, Detroit Michigan, August 1993

M. Das, M. J. Paulik, and Y-D Wang, "Classification of Planar Shapes Using Multiresolution Circular Autoregressive Models," IEEE Midwest Symposium on Circuits and Systems, Detroit Michigan, August 1993

M. Das, M. J. Paulik, and N. K. Loh, "A Two-Dimensional Autoregressive Modeling Technique for Analysis and Classification of Planar Shapes," Proceedings of the Twenty Sixth Allerton Conference on Communication, Control, and Computing, Urbana Ill., September 1988

## **PROFESSIONAL AND HONOR SOCIETY MEMBERSHIP**

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Senior IEEE Member of the:

Education Society  
Signal Processing Society,  
Circuits and Systems Society, and  
Control Systems Society.

Tau Beta Pi Engineering Nat'l Honor Society  
Eta Kappa Nu Elec. Eng. Nat'l Honor Society  
Alpha Sigma Nu, Nat'l Jesuit Honor Society