

KISHORE SUNDARA-RAJAN
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EDUCATION

University of Washington, Seattle, WA

Ph.D. in Electrical Engineering

Expected 2009

Topic: "Non-Destructive Estimation of Material Properties Using Fringing Electric Field Sensors"

Dissertation Focus: Microdielectrometry and MEMS

Advisory Committee: Prof. Alexander Mamishev, Prof. Karl Böhringer, Prof. Amir Parviz, Prof. Sam Jenekhe, and Prof. Kailash Kapur

University of Washington, Seattle, WA

M.S. in Electrical Engineering

2003

Thesis Title: "Moisture Measurement in Paper Pulp Using Fringing Field Dielectrometry"

Thesis Advisors: Prof. Alexander Mamishev, Prof. Karl Böhringer, and Prof. Richard Gustafson

University of Madras, India

B.E. in Electrical and Electronics Engineering

2001

Areas of Concentration: Analog and Digital Circuits, Power Systems, Control Theory

Thesis: "Ground Fault Detection Relay"

TEACHING EXPERIENCE

Energy Systems, UWEE

Laboratory Instructor and Teaching Assistant

Spring 2008

Oversaw the laboratory section of the course, made contributions to development of assignments and examinations, delivered guest lectures.

Modeling of MEMS, UWEE

Teaching Assistant

Winter 2006

Made contributions to the development of class materials, assignments, and projects; oversaw the laboratory section of the course and thought the use of modeling tools to students.

Devices and Circuits II, UWEE

Laboratory Instructor and Teaching Assistant

Spring 2006

Made significant contributions to the development of class materials, assignments, and projects; in charge of two sections of the course with a total of about 30 students; thought the laboratory section of the course.

Engineering Design by Teams, UWEE

Teaching Assistant

Autumn 2006

Delivered 3 lectures to the class; Organized a field trip for 29 students; Made some contribution to the course material; Facilitated guest lectures; Assisted in evaluation of assignments.

RESEARCH EXPERIENCE

Industrial Assessment Center, University of Washington

Lead Student

10/2006 – Present

Played the *lead role in starting, structuring, staffing and operation* of the center at UWEE; *Lead a team of 3 graduate and 5 undergraduate students*; Made significant contributions during the proposal writing phase; Represented UW at the national meeting for the centers.

<p>Sensors, Energy, and Automation Laboratory, University of Washington <i>Research Assistant</i></p> <p>Developed and optimized interdigital fringing field dielectric sensors, and experimental setups for measuring physical properties of materials for industrial applications; Conducted feasibility studies for various applications including pharmaceutical products and plastics; Assisted in writing proposals; <u>Interacted directly with industrial collaborators; Supervised a team of 5 undergraduate researchers, 1 graduate student, and 2 visiting professor.</u></p>	<p>2002 – Present</p>
<p>dTEC Systems LLC, Seattle, WA <i>Graduate Technical Intern</i></p> <p>Developed sensors and associated systems for sensing properties of food products; co-wrote a NSF SBIR proposal for renewed funding; directly interacted with other industrial partners to explore opportunities for product development.</p>	<p>6/2007 – 9/2007</p>
<p>Intel Research, Seattle, WA <i>Graduate Technical Intern</i></p> <p>Designed, and fabricated a self powered micro motion sensor for embedding in RFID tags for human activity inferencing. The MEMS based sensor design is a hybrid electro-mechanical system. Developed first order models for the mechanical behavior of the sensor. The work resulted in two patent disclosures, and one patent application.</p>	<p>6/2004 – 12/2005</p>
<p>Design, Testing, and Reliability Laboratory, University of Washington <i>Research Assistant</i></p> <p>Developed jitter measurement technique for PLLs as a part of a group of three members; Developed a charge pump for converting high frequency (2 GHz) digital pulses into analog signal; Acquired the basics of mixed signal circuit design.</p>	<p>3/2002 – 8/2002</p>
<p>Institute for Micromanufacturing, Louisiana Tech University, Ruston, LA <i>Research Assistant</i></p> <p>Designed, optimized, and implemented a testing system for micro pumps; Designed a magnetic actuator, the associated control circuitry, and monitoring software; Involved in the development of magnetic membranes, three dimensional chambers; Acquired basic familiarity with plasma enhanced chemical vapor deposition, electron microscopy (SEM), diffusion, and etching (RIE).</p>	<p>9/2001 – 3/2002</p>
<p>Bharat Heavy Electricals Limited, Hyderabad, India <i>Student Researcher</i></p> <p>Developed a technique to monitor systems for ground faults; Designed, fabricated and tested a ground fault relay for turbo generators; Lead a team of 2 other student researchers.</p>	<p>2000 - 2001</p>

PUBLICATIONS AND TALKS

Book

- A. V. Mamishev, K. Sundara-Rajan, and M. Zahn, "Interdigital Sensors and Transducers", IEEE Press, In Preparation.

Book Chapters

- K. Sundara-Rajan, A. V. Mamishev, and M. Zahn, "Fringing Electric and Magnetic Field Sensors", Encyclopedia of Sensors, v4, pp. 89-100, ISBN 1-58883-060-8, Oct 2005.
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Intellectual Property

1. J. R. Smith, J. Heck, and K. Sundara-Rajan, "Inertial switch using fully released and enclosed conductive contact bridge," U.S. Patent Application ID 20080237003, October 2008.
2. K. Sundara-Rajan, M. Ovir, A. H. Martin, and A. V. Mamishev, "Air Velocity Sensor System," Record of Invention filed with University of Washington, August 7, 2008.
3. K. Sundara-Rajan, A. Mathur, and A. V. Mamishev, "Spatial Deconvolution of Material Properties Using Fringing Electric Field Sensors", Record of Invention filed with University of Washington, March 18, 2008.
4. K. Sundara-Rajan, and J. R. Smith, "Low Acceleration Radial Inertial Switch Using Fully Released and Enclosed Contact Bridge," Disclosure filed with Intel Research, December 2005.

Peer Reviewed Publications

1. A. Mathur, K. Sundara-Rajan, G. Rowe, and A. V. Mamishev, "Dielectric Spectroscopy – Choosing the right approach", Pharmaceutical Technology, Vol. 9, no. 32, pp 82-93, Sep. 2008.
2. B. Jiang, J. R. Smith, M. Philipose, S. Roy, K. Sundara-Rajan, and A. V. Mamishev, "Energy Scavenging for Inductively Coupled Passive RFID Systems," Instrumentation and Measurement, IEEE Transactions on, vol. 56, no. 1, pp. 118-125, 2007.
3. J. R. Smith, B. Jiang, S. Roy, M. Philipose, K. Sundara-Rajan, and A. V. Mamishev, "ID Modulation: Embedding Sensor Data in an RFID Timeseries," Proceedings of Information Hiding 2005, LNCS 3727, pp. 234-246.
4. J. R. Smith, K. P. Fishkin, B. Jiang, A. Mamishev, M. Philipose, A. D. Rea, S. Roy, and K. Sundara-Rajan, "RFID-Based Techniques for Human-Activity Detection," Communications of the ACM, vol. 48, no. 9, pp. 39-44, 2005.
5. K. Sundara-Rajan, L. Byrd, and A. V. Mamishev, "Measuring Moisture, Fiber, and Titanium Dioxide in Pulp With Impedance Spectroscopy," TAPPI Journal, vol. 4, no. 2, pp. 23-27, Feb. 2005.
6. M. Philipose, J. Smith, B. Jiang, A. Mamishev, S. Roy, and K. Sundara-Rajan, "Battery-Free Wireless Identification and Sensing," IEEE Pervasive Computing, vol. 4, no. 1, pp. 37-45, 2005.
7. A. V. Mamishev, K. Sundara-Rajan, F. Yang, Y. Du, and M. Zahn, "Interdigital Sensors and Transducers," Proceedings of the IEEE, vol. 92, no. 5, pp. 808-845, 2004.
8. K. Sundara-Rajan, L. ByrdII, and A. V. Mamishev, "Moisture Content Estimation in Paper Pulp Using Fringing Field Impedance Spectroscopy," Sensors Journal, IEEE, vol. 4, no. 3, pp. 378-383, 2004.
9. K. Sundara-Rajan, L. Byrd, and A. V. Mamishev, "Estimation of Moisture Content in Paper Pulp Containing Calcium Carbonate Using Fringing Field Impedance Spectroscopy," Proceedings of 58th Appita Annual Conference, Canberra, Australia, vol. 2, 2004, pp. 413-419.

Abstract Refereed Publications

1. J. R. Smith, B. Jiang, S. Roy, M. Philipose, K. Sundara-Rajan, and A. V. Mamishev, "Embedding sensor data in an RFID timeseries", 7th Information Hiding Workshop, Barcelona, Spain, 2005.
2. J. Bing, J. R. Smith, M. Philipose, S. Roy, K. Sundara-Rajan, and A. V. Mamishev, "Energy Scavenging for Inductively Coupled Passive RFID Systems," Proceedings of the IEEE Instrumentation and Measurement Technology Conference, vol. 2, 2005, pp. 984-989.
3. A. L. Pyayt, K. Sundara-Rajan, G. I. Rowe, and M. A. L. Enlund, "On-Chip Characterization of Fluids Using Microsurface Plasmon Resonance Sensors," Optical Trapping and Optical Micromanipulation, vol. 5514, no. 1, pp. 586-594, Oct. 2004.
4. K. Sundara-Rajan, X. Li, N. Semenyuk, and A. V. Mamishev, "Moisture Measurement in Paper Pulp Using Fringing Field Impedance Spectroscopy," IEEE Sensors Conference, Toronto, 2003.

Talks Delivered

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- K. Sundara-Rajan, "Sensors for Industrial Applications," Invited Talk, International Institute of Information Technology, Hyderabad, India, December 2007.
 - K. Sundara-Rajan, and A. V. Mamishev, "Autonomous Microsensors based on Fringing Electric Field Sensing," Summer Institute 2007, Center for Process Analytical Chemistry, Seattle, July 2007.
 - K. Sundara-Rajan, and A. V. Mamishev, "Fringing Field Sensing and You," Summer Institute 2006, Center for Process Analytical Chemistry, Seattle, July 2006.
 - K. Sundara-Rajan, L. Byrd, and A. V. Mamishev, "Estimation of Moisture Content in Paper Pulp Containing Calcium Carbonate Using Fringing Field Impedance Spectroscopy," 58th Appita Annual Conference, Canberra, Australia, April 2004.
 - K. Sundara-Rajan, and A. V. Mamishev, "Monitoring Physical Properties of Pharmaceutical Products Using Fringing Field Dielectric Spectroscopy," Eighteenth International Forum Process Analytical Chemistry, IFPAC 2004, Arlington, VA, January 2004.
 - K. Sundara-Rajan, and A. V. Mamishev, "Non-Invasive Measurement of Material Properties," Center for Process Analytical Chemistry Fall Meeting, Seattle, November 2003.

AWARDS

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|---|--------------------|
| • 2008 UW Electric Energy Industrial Consortium's Research Poster Award, 3rd Place, Graduate Category | 2008 |
| • 2006 UW Electric Energy Industrial Consortium's Research Poster Award, 2nd Place, Graduate Category | 2006 |
| • IEEE Dielectric and Electrical Insulations Society's Graduate Fellowship | 2003 – 2004 |
| • Student grant to attend the Eighteenth International Forum Process Analytical Chemistry | 2004 |
| • IEEE Travel Grant awarded to attend IEEE Sensors Conference | 2003 |
| • Chairman's special mention and Best student award | 2001 |
| • "Diamond Ring" for consistent academic excellence | 2001 |
| • 7 "Gold Rings" for academic excellence | 1997 – 2001 |
| • Best incoming student of the year award | 1997 |

SYNERGETIC ACTIVITIES

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- President (Finance) for UW chapter of "Leadership Institute for Tomorrow".
 - Reviewer for IEEE Sensors Journal.
 - Reviewer for IEEE Transactions on Dielectrics and Electrical Insulation.
 - Reviewer for IEEE Transactions on Instrumentation and Measurement.
 - Reviewer for EURASIP Journal on Applied Signal Processing
 - Reviewer for Journal of Physics D: Applied Physics
 - Reviewer for Journal of Physics: Condensed Matter
 - Reviewer for Nanotechnology

PROFESSIONAL MEMBERSHIPS

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- IEEE — Institute of Electrical and Electronics Engineers
 - SPIE—The International Society for Optical Engineering
 - DEIS – Dielectric and Electrical Insulation Society
 - LIFT – Leadership Institute for Tomorrow
 - SEBA – Science and Engineering Business Association

