

MUSTAFA ILKER BEYAZ

Department of Electrical and Electronics Engineering,
Antalya International University, Antalya, TURKEY
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PROFESSIONAL EXPERIENCE

Assistant Professor

November 2011 – present

Department of Electrical and Electronics Engineering,
Antalya International University, Antalya, Turkey

Graduate Research Assistant

August 2005 – October 2011

Department of Electrical and Computer Engineering,
University of Maryland, College Park, MD, USA

RESEARCH INTERESTS

Micro electro mechanical systems (MEMS), small scale energy conversion (Power MEMS), energy harvesting, micro motors/generators/pumps, biological microsystems (BioMEMS), microfluidics and lab on a chip devices, micro/nano actuators, nanostructured materials for sensors and energy applications

EDUCATION

Ph.D. in Electrical Engineering, University of Maryland, College Park, MD, USA

October 2011

Advisor: Professor Reza Ghodssi

Dissertation: An integrated electromagnetic micro-turbo-generator supported on encapsulated microball bearings

M.S. in Electrical and Computer Engineering, University of Maryland, College Park, MD, USA

August 2008

Advisor: Professor Reza Ghodssi

Thesis: Closed-loop control of a micropositioner using integrated photodiode sensors

B.S. in Electrical and Electronics Engineering, Middle East Technical University, Ankara, Turkey

June 2005

RESEARCH GRANTS AND PROJECTS

RGP1. Project Title: “The Development of A Lab-On-A-Chip System for Sterilization Monitoring,” submitted to The Scientific and Technological Research Council of Turkey (TUBITAK) 1003 Programme, September 2014, Position: Principal Investigator, Antalya International University.

RGP2. Project Title: “An In-Vivo Microgenerator for Electronic Bioimplants,” submitted to TUBITAK 2525 Programme, June 2014, Position: Principal Investigator, Antalya International University.

RGP3. Project Title: “The Development of A MEMS Generator for Respiration Harvesting,” Position: Principal Investigator, Funding Source: TUBITAK 3501 Programme, Funding Amount: 220,000 TL (= \$113,000), Duration: October 2013 – October 2016, Antalya International University.

RGP4. Project Title: “NANOSEQ: A Nanopore-Based Platform for Fast and Low-Cost DNA Sequencing,” Position: Project Consultant, Funding Source: TUBITAK 1511 Programme, Funding Amount: 1,000,000 TL (= \$450,000), Duration: July 2014 – July 2016, Antalya International University.

RGP5. Project Title: “Establishment of A Microfabrication Laboratory for Sensors Development,” Position: Principal Investigator, Funding Source: West Mediterranean Development Agency of Turkey (BAKA) Financial Support Programme, Funding Amount: 420,000 TL (= \$ 215,000), Duration: June 2013 – March 2014, Antalya International University.

- RGP6. Project Title: “An Integrated Electromagnetic Micro-Turbo-Generator Supported on Encapsulated Microball Bearings,” Position: Graduate Student Researcher (Ph.D. project), Funding Source: National Science Foundation of USA (NSF), Duration: August 2008 – October 2011, University of Maryland, College Park.
- RGP7. Project Title: “Closed-Loop Control of A Micropositioner Using Integrated Photodiode Sensors,” Position: Graduate Student Researcher (M.Sc. project), Funding Source: Army Research Laboratory of USA (ARL), Duration: August 2005 – August 2008, University of Maryland, College Park.
- RGP8. Project Title: “Design of The Next-Generation Air-Core Ethernet Micro Transformers,” Position: Graduate Student Researcher, Funding Source: NSF, Duration: 2008 - 2009, University of Maryland, College Park.
- RGP9. Project Title: “Development of a MEMS Power Harvester for Flying Insects,” Position: Project Supervisor, Duration: 2008 – 2009, University of Maryland, College Park.
- RGP10. Project Title: “Design and Fabrication of A Capillary Electrophoresis System for Spatial and Temporal Separation of DNA Biomolecules,” Position: Graduate Student Researcher, Duration: 2007 - 2008, University of Maryland, College Park.
- RGP11. Project Title: “Design of A Piezoelectric Energy Scavenger for Harvesting Wind Power in Small Scale,” Position: Graduate Student Researcher, Duration: 2006 – 2007, University of Maryland, College Park.
- RGP12. Project Title: “Finite Element Analysis and Testing of GHz-Range MEMS Resonators for Transceiver Applications,” Position: Undergraduate Student Researcher, Duration: Summer 2004, University of California, Berkeley.

TEACHING AND SUPERVISING EXPERIENCE

Instructor, PHYS 101 General Physics I *Spring-Fall 2014*
 Department of Electrical and Electronics Engineering, Antalya International University

Instructor, EE 201 Circuit Theory I *Fall 2014*
 Department of Electrical and Electronics Engineering, Antalya International University

Co-Instructor, ENEE 204 Basic Circuit Theory *Spring 2010*
 Department of Electrical and Computer Engineering, University of Maryland, College Park

Volunteer Teaching Assistant / Project Supervisor *Fall 2008 – Fall 2010*
 ENEE 605 Design and Fabrication of MEMS, ENEE 719F Fabrication and Testing of MEMS
 Department of Electrical and Computer Engineering, University of Maryland, College Park

Cleanroom Manager *August 2007 – August 2009*
 MEMS Sensors and Actuators Laboratory
 Department of Electrical and Computer Engineering, University of Maryland, College Park

Student Advisor and Mentor
 Mr. Utku Göreke and Mrs. Sahar Habibiabad, Antalya International University
 Mr. Christian Schaffer, Mr. Jeremy Feldman, and Mr. Matthew Mosteller, University of Maryland, College Park

HONORS AND AWARDS

- Conference paper selected as one of the best papers of IEEE Sensors 2012 Conference *October 2012*
- James Clark School of Engineering, Dean’s Doctoral Research Award *May 2010*
- Electrical and Computer Engineering Distinguished Dissertation Fellowship *March 2010*
- Electrical and Computer Engineering Department Council, University of Maryland, College Park *2009 – 2010*
- Clark School of Engineering Future Faculty Program Fellow *January 2009 – May 2010*
- Graduated with honors, Middle East Technical University *June 2005*

PROFESSIONAL ACTIVITIES

- Conference technical program committee member
 - *Power MEMS 2014, Hyogo, Japan, November 2014*
 - *IEEE Sensors 2014, Valencia, Spain, November 2014*
 - *Power MEMS 2013, London, UK, December 2013*
 - *IEEE Sensors 2012, Taipei, Taiwan, October 2012*
- TUBITAK project review consultant and project panelist
- Journal editor
 - *Turkish Journal of Electrical Engineering & Computer Sciences*
- Manuscript technical reviewer
 - *Journal of Microelectromechanical Systems*
 - *Sensors and Actuators A: Physical*
 - *IEEE Transactions on Magnetics*
 - *IEEE Transactions on Industrial Electronics*
 - *Precision Engineering*
 - *Turkish Journal of Electrical Engineering & Computer Sciences*
- Institute of Electrical and Electronics Engineers (IEEE) member

PATENTS

- P1. M. I. Beyaz, C. M. Waits, R. Ghodssi, US patent application number: 13603450, filed in 2012.

PUBLICATIONS

Journal Publications

- J1. K. Y. Ozkaya, U. Goreke, M. I. Beyaz, "An Investigation on the Electromagnetic Design Optimization of Rotary Micromachines with Double-Layer Permanent Magnets," *submitted to Sensors and Actuators A: Physical*, September 2014.
- J2. B. Hanrahan, S. Misra, M. I. Beyaz, J. Feldman, C. M. Waits, R. Ghodssi, "An Adhesion-Dominated Rolling Friction Regime Unique to Micro-Scale Ball Bearings," *Tribology Letters*, DOI: 10.1007/s11249-014-0401-5, September 2014.
- J3. M. I. Beyaz, "A Numeric Investigation on the Design of MEMS-Scale Rotary Magnetic Machines for Power Conversion Applications," *submitted to Turkish Journal of Electrical Engineering and Computer Sciences*, June 2014.
- J4. M. I. Beyaz, B. Hanrahan, J. Feldman, and R. Ghodssi, "Monitoring of Actuation Conditions in a Micro-Turbo-Generator," *IEEE Sensors Journal*, vol. 13, issue 8, pp. 2937-2943, August 2013.
- J5. M. I. Beyaz, B. Hanrahan, J. Feldman, and R. Ghodssi, "An Integrated Permanent Magnet Micro-Turbo-Generator Supported on Microball Bearings," *Journal of Microelectromechanical Systems*, vol. 22, issue 3, pp. 794-803, June 2013.
- J6. M. McCarthy, C.M. Waits, M. I. Beyaz, and R. Ghodssi, "A Rotary Microactuator Supported on Encapsulated Microball Bearings Using An Electro-Pneumatic Thrust Balance," *Journal of Micromechanics and Microengineering*, vol. 19, issue 9, pp. 1-7, August 2009.
- J7. M. I. Beyaz, M. McCarthy, N. Ghalichechian, and R. Ghodssi, "Closed-Loop Control of A Long-Range Micropositioner Using Integrated Photodiode Sensors," *Sensor and Actuators A: Physical*, 151, pp 187-194, April 2009.
- J8. D. Bowen, I. Mayergoyz, C. Krafft, D. Kroop, and M. I. Beyaz, "On Design of Air-Core Ethernet Transformers," *Journal of Applied Physics*, 105, 07A307, February 2009.
- J9. N. Ghalichechian, A. Modafe, M. I. Beyaz, and R. Ghodssi, "Design, Fabrication, and Characterization of A Rotary Micromotor Supported on Microball Bearings," *Journal of Microelectromechanical Systems*, vol. 17, no. 3, pp. 632-642, June 2008.

Conference Proceedings and Presentations

Presenter underlined, [P]: Full paper, [L]: Long abstract, [S]: Short abstract

- C1. U. Goreke, K. Azgin, M. I. Beyaz, "Design and Electromagnetic Optimization of a Respiration Harvester," *Proceedings of the Eurosensors 2014 Conference*, pp. A4P-H01, Brescia, Italy, September 7-10, 2014. [P]
- C2. M. I. Beyaz, B. Hanrahan, J. Feldman, and R. Ghodssi, "Integrated Sensing of Mechanical Parameters in a Micro-Turbo-Generator," *Proceedings of the 11th IEEE Sensors Conference (Sensors 2012)*, pp. 2062-2065, Taipei, Taiwan, October 28-31, 2012. [P]
- C3. M. I. Beyaz, B. Hanrahan, J. Feldman, and R. Ghodssi, "An Integrated Electromagnetic Micro-Turbo-Generator Supported on Encapsulated Microball Bearings," *Proceedings of the 25th International Conference on Micro Electro Mechanical Systems (MEMS 2012)*, pp. 1209-1212, Paris, France, January 29 – February 2, 2012. [P]
- C4. R. Ghodssi, B. Hanrahan, M. I. Beyaz, "Microball Bearing Technology for MEMS Devices and Integrated Microsystems," *Proceedings of the 16th International Conference on Solid-State Sensors, Actuators, and Microsystems (Transducers 2011)*, pp. 1789-1794, Beijing, China, June 5-9, 2011. [P]
- C5. M. I. Beyaz, B. Hanrahan, and R. Ghodssi, "First Silicon Microturbine with Integrated Permanent Magnets Supported on Encapsulated Microball Bearings," *Proceedings of the 10th International Workshop on Micro and Nanotechnology for Power Generation and Energy Conversion Applications (Power MEMS '10)*, pp. 167-171, Leuven, Belgium, November 30 – December 3, 2010. [P]
- C6. B. Hanrahan, M. I. Beyaz, M. McCarthy, C.M. Waits, and R. Ghodssi, "A New Performance Regime for Microfabricated Ball Bearings," *Proceedings of the 10th International Workshop on Micro and Nanotechnology for Power Generation and Energy Conversion Applications (Power MEMS '10)*, pp. 191-194, Leuven, Belgium, November 30 – December 3, 2010. [P]
- C7. M. I. Beyaz, B. Hanrahan, and R. Ghodssi, "Microball Bearings for Microsystems Integration," *2010 Solid-State Sensor, Actuator, and Microsystems Workshop*, Open Poster Session, Hilton Head Island, SC, US, June 6-10, 2010. [L]
- C8. M. I. Beyaz, M. McCarthy, and R. Ghodssi, "Fabrication of High-Aspect-Ratio Metal Structures with Planar Surfaces for Power MEMS Devices," *Proceedings of the 9th International Workshop on Micro and Nanotechnology for Power Generation and Energy Conversion Applications (Power MEMS '09)*, pp. 586-588, Washington DC, US, December 1-4, 2009. [P]
- C9. M. McCarthy, C. M. Waits, M. I. Beyaz, and R. Ghodssi, "A Rotary Microactuator Supported on Encapsulated Microball Bearings Using an Electro-Pneumatic Thrust Balance," *Proceedings of the 22nd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2009)*, pp. 1095-1098, Sorrento, Italy, January 25-29, 2009. [P]
- C10. M. I. Beyaz, M. McCarthy, N. Ghalichechian, and R. Ghodssi, "Feedback Control of A Long Range Micropositioner," *MEMS Alliance Symposium*, Johns Hopkins University - Applied Physics Lab, Laurel, MD, US, November 24, 2008. [S]
- C11. M. McCarthy, C. M. Waits, M. I. Beyaz, and R. Ghodssi, "Rotary Microactuators Supported on Encapsulated Microball Bearings," *MEMS Alliance Symposium*, Johns Hopkins University - Applied Physics Lab, Laurel, MD, US, November 24, 2008. [S]
- C12. M. McCarthy, M. I. Beyaz, C. M. Waits, and R. Ghodssi, "An Electro-Pneumatic Thrust Balance for Small-Scale Energy Conversion Using Encapsulated Rotary Microball Bearings," *Proceedings of the 8th International Workshop on Micro and Nanotechnology for Power Generation and Energy Conversion Applications (Power MEMS '08)*, pp. 129-132, Sendai, Japan, November 9-12, 2008. [P]
- C13. M. I. Beyaz, M. McCarthy, N. Ghalichechian, and R. Ghodssi, "Closed-Loop Control of A Long Range Microactuator," *Proceedings of the ASME International Mechanical Engineering Congress & Exposition*, Boston, MA, US, October 31-November 6, 2008. [L]
- C14. M.I. Beyaz, M. McCarthy, N. Ghalichechian, and R. Ghodssi, "Photodiode Position Sensors for Integrated Feedback Control of A Long-Range Micropositioner," *Proceedings of the 7th IEEE Sensors Conference (Sensors 2008)*, pp. 803-806, Lecce, Italy, October 26-29, 2008. [P]
- C15. M. I. Beyaz, M. McCarthy, C. M. Waits, B. Hanrahan, and R. Ghodssi, "Microball Bearing Technology for MEMS," *2008 Solid-State Sensor, Actuator, and Microsystems Workshop*, Open Poster Session, Hilton Head Island, SC, US, June 1-5, 2008. [L]

- C16. M. I. Beyaz, N. Ghalichechian, and R. Ghodssi, "Toward An Autonomous Electrostatic Micromotor: Integrated Feedback Control," *Proceedings of the 21st IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2008)*, pp. 483-486, Tucson, AZ, US, January 13-17, 2008. [P]
- C17. N. Ghalichechian, M. McCarthy, M. I. Beyaz, and R. Ghodssi, "Measurement and Modeling of Friction in Linear and Rotary Micromotors Supported on Microball Bearings," *Proceedings of the 21st IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2008)*, pp. 507-510, Tucson, AZ, US, January 13-17, 2008. [P]
- C18. M. I. Beyaz, N. Ghalichechian, and R. Ghodssi, "Toward Smart Micromachines with Integrated Feedback Control," *International Semiconductor Device Research Symposium*, College Park, MD, US, December 12-14, 2007. [L]
- C19. M. I. Beyaz, N. Ghalichechian, and R. Ghodssi, "Towards Feedback Control with Integrated Position Sensing in Micromachines," *American Vacuum Society 54th International Symposium*, Seattle, WA, US, October 14-19, 2007. [S]
- C20. M. I. Beyaz, N. Ghalichechian, and R. Ghodssi, "Toward Smart Micromachines with Integrated Feedback Control," *MEMS Alliance Symposium*, Rockville, MD, US, October 2, 2007. [S]
- C21. N. Ghalichechian, A. Modafe, M. I. Beyaz, and R. Ghodssi, "A Rotary Micromotor Supported on Microball Bearings," *The 14th International Conference on Solid-State Sensors, Actuators, and Microsystems (Transducers '07)*, Lyon, France, June 10-14, 2007. [P]
- C22. N. Ghalichechian, A. Modafe, M. I. Beyaz, C. M. Waits, B. Geil, and R. Ghodssi, "Design and Fabrication of a Rotary, Electrostatic Micromotor Supported on Microball Bearings," *Proceedings of the 6th International Workshop on Micro and Nanotechnology for Power Generation and Energy Conversion Applications (Power MEMS '06)*, pp. 227-230, Berkeley, CA, US, November 29-December 1, 2006. [P]
- C23. N. Ghalichechian, A. Modafe, M. I. Beyaz, and R. Ghodssi, "Chemical Mechanical Planarization of BCB Polymer Films: Effect of Cure Temperature," *AVS 53rd International Symposium*, San Francisco, CA, US, November 12-17, 2006. [S]

SEMINARS AND TALKS

- "Electrical Power Generation for Microsystems," Physics Department, Akdeniz University, Antalya, Turkey, April 12, 2013.
- "Towards High-Density Power Sources for Integrated Microsystems: An Electromagnetic Micro-Turbo-Generator," National Nanotechnology Research Center (UNAM), Bilkent University, Ankara, Turkey, June 8, 2012.