Wathiq Ibrahim Curriculum Vitae

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Summary

Research and Postdoctoral Associate of Mechanical engineering with over six years of experience in research and development of mechanical devices, microstructures, and energy harvesters and their linear and non-linear behavior under motion. Broad expertise includes design, analysis, modeling, and simulation including Finite Element Analysis (FEA) of mechanics of materials, structural designs, and vibrations as well as the design of experiments and hands-on laboratory experience with prototypes, instrumentation, and test stands. Detailed-oriented and versatile, having served in a wide variety of different roles: leader of research team projects, lab manager, mechanical engineering researcher, conformity engineer, and author and presenter of numerous papers and presentations. Solid verbal and written communication. Equally effective as an individual contributor or project team leader. PhD-educated in mechanical engineering.

Technical Skills

Computational and Programming

Mathematica | Matlab | SolidWorks | AutoCAD | Latex | Finite Element Analysis-FEA | ANSYS | Microsoft Office | LabVIEW | Perturbation Techniques | Method of Harmonic Balance | Shooting Techniques | Stability Analysis | Method of Multiple Scales.

Experimental

Characterization techniques at the Micro and Nanoscale: Micro System Analyzer-MSA | Ultra High Frequency-UHF | Laser Doppler Vibrometers | Wyko Surface Profilometers | Actuators | Fall Detection | PUMA Spectral Dynamics | Energy Harvesting | Triboelectric generator| MTS| VIVO | Voltage & Current Measurements.

Teaching

Physics | Calculus and Differential | Static | Dynamics | Thermodynamics | Strength of Materials | Calculus with Engineering Technology Applications | Mechanical Measurements and Instrumentation | Vibration | Heat Transfer | Machine Design | Mechanical Design | Solid Mechanics | Applied Solid Modeling Technical Calculus| Structural Mechanics| Analytical methods | Equations with Applications | Elasticity | Advances Mechanical Vibrations | Finite Element Analysis | Nonlinear Dynamics | Advance Dynamics | MEMS/NEMS | Random Vibration.

Communication

- Solid written/verbal skills.
- Creating and delivering presentations and reports to an executive level audience.
- Explaining elaborate, complex problems to professionals from diverse backgrounds.

Analytical

Structural and mechanical components analysis and modeling. Skilled in analytical techniques for analyzing linear and nonlinear vibration problems of electronics and sensors.

Current Employment

Post-Doctoral Engineer: **The State University of New York at Binghamton, Binghamton, NY**
(Sep 2017 - Present)

- Developed smart energy harvesters using piezoelectric and triboelectric transduction mechanisms.
- Developed a triboelectric impact-vibration energy harvester.
- Optimized the efficiency of the energy harvesters by increasing the bandwidth of the resonator near it primary resonances.
- Led a team of researchers to study the viability of powering a MEMS switches using a triboelectric generator producing a voltage from an impact to produce combined sensor-switch systems.
- Helped a team of researchers to develop a tunable triboelectric energy harvester using axial loading, which can be promising for Energy Harvesting applications from ambient at low-frequency range.
- Performed a feasibility study of the triboelectric transduction for self-powered load sensing system for total knee replacement applications.
- Developed and Optimized triboelectric energy harvester with power management and digitization circuitry that can installed in Total Knee Replacement (TKR) implants, allowing load sensing to incorporate into any TKR system.

Other Professional & Academic Experience

Research Associate: **The State University of New York at Binghamton, Binghamton, NY**
(Jan 2015 - July 2017) Developed Piezoelectric and Triboelectric Energy Harvesters.
(May 2014 - Sep 2014) Investigated theoretically and experimentally the dynamics of MEMS.
(May 2013 - Aug 2013) Enhanced the bandwidth of micro-resonators.
(Aug 2011 - Aug 2012) Developed a fall detection sensor for elders.

Research Scientist: **King Abdullah University of Science and Technology (KAUST), KSA**
(Sep 2014 – Dec 2014) Broaden the bandwidth of the micro resonator near its primary resonances using multi-frequency excitations, which can be promising different applications.

Teaching Assistant: **The State University of New York at Binghamton, Binghamton, NY**
(Aug 2013 - May 2014) Taught courses: Statics and Dynamics.
(Aug 2012 - May 2013) Taught courses: Vibrations and Engineering Programming.

Conformity Assessment: **Royal Scientific Society, Amman, Jordan**
(Sep 2008 - Feb 2011) Liquefied Petroleum Gas Inspector and Product Certification.

Technical Engineer: **Superior Heavy Equipment Trading Company, Amman, Jordan**
(Sep 2007 - Aug 2008) Consultant engineer, spare parts, and lubricants.

Teaching Assistant: **Jordan University for Science and Technology (JUST), Irbid, Jordan**
(Aug 2006 - May 2007) Taught courses: Strength of Materials, Thermodynamics.

Research Assistant: **Jordan University for Science and Technology (JUST), Irbid, Jordan**
(Sep 2006 - Feb 2007) Data analysis for a UNDP project.

Educations

Ph.D., Mechanical Engineering | Aug. 2017| The State University of New York at Binghamton, NY.
M.S., Mechanical Engineering | May 2013| The State University of New York at Binghamton, NY.
B.S., Mechanical Engineering | June 2006 | Jordan University for Science and Technology (JUST), Jordan

Publications

Journal Publications:

1- Nelson, Daniel, **Ibrahim**, Alwathiqbellah I., and Shahrzad Towfighian "Tunable Triboelectric Wideband Energy Harvester". Journal of Sound and Vibration (Under review Aug 2018).
2- Nelson, Daniel, **Ibrahim**, Alwathiqbellah I., and Shahrzad Towfighian "Dynamics of a Threshold Shock Sensor: Combining Bi-stability and Triboelectricity". Sensors & Actuators: A. Physical (Under review Aug 2018).
3- **Ibrahim**, Alwathiqbellah, Jain, Manav, Salman, Emre, Willing, Ryan, and Shahrzad Towfighian "A Smart Knee Implant Using Triboelectric Energy Harvesters". Journal of ASME/IEEE Transactions on Mechatronics. (Under review July 2018).
4- **Ibrahim**, Alwathiqbellah, Abdallah Ramini, and Shahrzad Towfighian. "Experimental and theoretical investigation of an impact vibration harvester with triboelectric transduction." Journal of Sound and Vibration 416 (2018): 111-124.
5- **Ibrahim,** Alwathiqbellah**,** Shahrzad Towfighian, and Mohammad I. Younis. "Dynamics of transition regime in bistable vibration energy harvesters." Journal of Vibration and Acoustics 139.5 (2017): 051008.
6- **Ibrahim**, **Alwathiqbellah**; Jaber, Nizar; Chandran, Akhil; Thirupathi, Maloth; Younis, Mohammad. 2017. "Dynamics of Microbeams under Multi-Frequency Excitations." Micromachines 8, no. 2: 32.
7- Ramini, Abdallah, **Ibrahim**, **Alwathiqbellah** and Younis, Mohammad. "Mixed frequency excitation of an electrostatically actuated resonator." Microsystem Technologies (2015): 1-8.
8- **Ibrahim**, **Alwathiqbellah**, and Mohammad I. Younis. "Simple fall criteria for MEMS sensors: data analysis and sensor concept." Sensors 14.7 (2014): 12149-12173.

Conferences Publications:

1- **Ibrahim**, Alwathiqbellah, Jain, Manav, Salman, Emre, Willing, Ryan, and Shahrzad Towfighian "FEASIBILITY OF TRIBOELECTRIC ENERGY HARVESTING AND LOAD SENSING IN TOTAL KNEE REPLACEMENT". Proceedings of the ASME 2018 Conference on Smart Materials, Adaptive Structures and Intelligent Systems SMASIS2018, September 10-12, 2018, San Antonio, TX, USA (Accepted 2018).
2- **Ibrahim**, Alwathiqbellah, Jain, Manav, Salman, Emre, Willing, Ryan, and Shahrzad Towfighian "A Smart Knee Implant Using Triboelectric Energy Harvesters". Canadian Bone and Joint Conference 2018 – Poster Presentation & Evaluations, May 11 & 12.
3- Nelson, Daniel, **Ibrahim**, Alwathiqbellah I., and Shahrzad Towfighian "NUMERICAL SIMULATIONS OF A TUNABLE TRIBOELECTRIC ENERGY HARVESTER". Proceedings of the ASME 2018 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference.
4- Pally, Mark, **Ibrahim**, Alwathiqbellah I., and Shahrzad Towfighian "A MEMS THRESHOLD ACCELERATION SWITCH POWERED BY A TRIBOELECTRIC GENERATOR". Proceedings of the ASME 2018 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (Accepted 2018).
5- **Ibrahim**, Alwathiqbellah, Yang, Wei, and Shahrzad Towfighian "Internal resonance of T-shaped structure for energy harvesting with magnetic nonlinearity". **SPIE** Smart Structures and Materials Nondestructive Evaluation and Health Monitoring, **2018**.
6- **Ibrahim**, **Alwathiqbellah**, Shahrzad Towfighian, Mohammad Younis, and Quang Su. "Magnetoelastic beam with extended polymer for low frequency vibration energy harvesting." In SPIE Smart Structures and Materials Nondestructive Evaluation and Health Monitoring, pp. 98060B-98060B. International Society for Optics and Photonics, 2016.

7- **Ibrahim**, Alwathiqbellah, Abdallah Ramini, and Shahrzad Towfighian. "Modeling an Impact Vibration Harvester with Triboelectric Transduction." ASME 2017 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. American Society of Mechanical Engineers, 2017.

8- **Ibrahim**, **Alwathiqbellah** I., and Mohammad I. Younis. "Simple Fall Criteria for MEMS Sensors: Data Analysis and Sensor Concept." ASME 2014 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. American Society of Mechanical Engineers, 2014.

Awards & Honors

- **Graduate Assistant scholarship**, Department of Mechanical Engineering, Binghamton University, NY, USA (Jan. /2015 – Aug. 2017).
- **ASME TCVS Travel Grant**, Technical Committee on Vibration and Sound, 2017 IDETC VIB Conference, Cleveland, Ohio, USA (Aug. 2017).
- **Research Scientist Fellowship**, Department of Mechanical Engineering, King Abdullah University of Science and Technology, Thuwal, KSA (Sep. 2014 – Dec. 2014).
- **GSO Travel Grant**, Graduate Student Organization of Binghamton University, Binghamton University, NY, USA (Aug. 2014).
- **Teaching Assistant scholarship**, Department of Mechanical Engineering, Binghamton University, NY, USA (Aug. 2012 - Jun. 2014).
- **Research Assistant scholarship**, Department of Mechanical Engineering, Binghamton University, NY, USA (Aug. 2011 - Jul. 2012).
- **B.S. Honor Degree**, Ranked the 1st among all students in the Mechanical Engineering Department, Jordan University of Science and Technology (JUST), Jordan (Jun. 2006).

Certifications

- "Technology & Characterization at the Nanoscale", Cornell Nanoscale Science and Technology Facility, Cornell University, June 2015.
- "Radiation Protection", RSS, Jordan, January - July 2010.
- "*Auditing Analytical Laboratories*", RSS, Jordan, February 2010.
- "ISO/IEC 9001: 2008 Standard, Appreciation & Interpretation", RSS, Jordan, June 2009.
- "Liquid Penetrant Testing (PT)-Level II", RSS, Jordan, November 2009.
- "Magnetic Particle Testing (MT)-Level II", RSS, Jordan, November 2009.
- "Radiographic Testing (RT)-Level II", RSS, Jordan, October 2009.
- "International Computer Driving License – ICDL", RSS, Jordan, January - March 2009.
- "Electronic Fuel Injection & Control", Buthaina Center, Jordan, January - June 2005.

Memberships

- Institute of Electrical and Electronics Engineers (IEEE), 2013 - present.
- American Society of Mechanical Engineers (ASME), 2013 - present.
- Jordan Engineers Association (JEA), 2006 - present.