Bao Zhao

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EDUCATION

University of California, Los Angeles (UCLA) **Los Angeles, USA**
Doctor of Philosophy in Mechanical Engineering *2020- 2024*

University of Chinese Academy of Sciences (UCAS) **Shanghai, China**
Master of Science in Electronic Engineering *2017- 2020*
Awards: Academic Scholarship; Excellent Student Award

Harbin Engineering University (HEU) **Harbin, China**
Bachelor of Engineering in Marine Engineering *2013- 2017*
Awards: The First Prize Scholarship; Excellent Student Award

RESEARCH

Bio-Inspired Robot Fish **Shanghai, China**
Supported by the grants from ShanghaiTech University *Oct. 2019- Now*

- Explored the feasibility of the piezoelectric material actuated soft robotic fish. Designed an integrated solution for realizing the **two-dimensional movements**.

Increaseing the Nonlinear Energy Harvesting Bandwidth **Shanghai, China**
Supported by the grants from NSFC and ShanghaiTech University *Mar. 2019- Oct. 2019*

- Analyzed the **influence of phase-variable topologies on the hysteresis frequency range of nonlinear systems**, proposed a potential way to **tune nonlinear dynamics** with circuit solutions.

Bidirectional Energy Conversion Circuit **Shanghai, China**
Collaborated with The Chinese University of Hong Kong (CUHK) *Jul. 2018- Apr. 2019*

- Designed the **bidirectional energy conversion circuit** for the dual functions of energy harvesters and actuators **for the first time**. Achieved **controllable orbit jumps** in monostable and bistable systems.

Circuit Solutions towards Broadband Piezoelectric Energy Harvesting **Shanghai, China**
Supported by the grants from NSFC and ShanghaiTech University *Sept. 2017- Jun. 2018*

- Analyzed the **impedance models** and their **electromechanical dynamics** of different phase-variable circuits for broadband energy harvesting. Specifically, proposed the **Phase-variable parallel synchronized triple bias-flip interface circuit**.

PUBLICATIONS

Journal Papers

- **B. Zhao**, J. Wang, J. Liang, and W.-H. Liao, "A Dual-effect Solution for Broadband Piezoelectric Energy Harvesting" **Applied Physics Letters**, 2020. [Link]
- J. Wang, **B. Zhao**, W.-H. Liao, and J. Liang, "New insight into piezoelectric energy harvesting with mechanical and electrical nonlinearities" **Smart Materials and Structures**, 2020. [Link]
- C. Chen, **B. Zhao**, J. Liang, "Revisit of Synchronized Electric Charge Extraction in Piezoelectric Energy Harvesting by Using Impedance Modeling," **Smart Materials and Structures**, 2019. [Link]
- **B. Zhao**, J. Liang, " Circuit Solutions towards Broadband Piezoelectric Energy Harvesting: An Impedance Analysis," **IEEE/ASME Transactions on Mechatronics**, In Review.

- **B. Zhao**, K. Zhao, J. Liang, Z. Chen, and X. Wang, "Series Synchronized Triple Bias-Flip Circuit: Maximizing the Usage of Single Storage Capacitor for Piezoelectric Energy Harvesting Enhancement" **IEEE Transactions on Power Electronics**, In Preparation.
- **B. Zhao**, J. Wang, J. Liang, and W.-H. Liao, "A New Control Strategy for S3BF Piezoelectric Interface Circuit towards Time-Sharing Energy Harvesting and Vibration Excitation" **IEEE Transactions on Industrial Electronics**, In Preparation.
- J. Wang, **B. Zhao**, W.-H. Liao, and J. Liang, "Energy harvesting synergy of nonlinear mechanical transformer and bidirectional energy conversion circuit" **Applied Energy**, In Preparation.

Conference Papers

- **B. Zhao**, J. Wang, J. Liang, and W.-H. Liao, "A bidirectional energy conversion circuit for piezoelectric energy harvesting and vibration exciting purposes," in **SPIE SS/NDE 2019**, Denver, CO, USA. [Link], [Demo]
- **B. Zhao**, J. Liang, and K. Zhao, "Phase-Variable Control of Parallel Synchronized Triple Bias-Flips Interface Circuit towards Broadband Piezoelectric Energy Harvesting," in **IEEE ISCAS 2018**, Florence, Italy. [Link]
- **B. Zhao** and J. Liang, "On the circuit solutions towards broadband and high-capability piezoelectric energy harvesting systems," in **SPIE SS/NDE 2018**, Denver, CO, USA. [Link]
- J. Wang, **B. Zhao**, J. Liang, and W.-H. Liao, "Orbit jumps of monostable energy harvesters by a bidirectional energy conversion circuit," in **ASME IDETC/CIE 2019**, Anaheim, CA, USA. [Link]
- G. Hu, **B. Zhao**, L. Tang, J. Liang, and Raj Das, "Optimization of cantilevered piezoelectric energy harvester with standard DC interface circuit," in **ISMA 2018**, Leuven, Belgium. [Link]

Copyright

- **Bao Zhao**, "Temperature and Humidity Online Monitor for Smart Home Applications," China Software Copyright, No. 2016SR237779.

PROFESSIONAL EXPERIENCE

Reviewer of: *Smart Materials and Structures*

Teaching Assistant

Microelectromechanical Systems (MEMS) — *Spring 2019 @ ShanghaiTech*

Mechanical Vibration and Noise — *Fall 2016 @ HEU*

Research Assistant

Institute of Vibration and Noise — *Sept. 2016- May 2017 @ HEU*

Assistant Engineer

China Shipbuilding Industry Group Co., Ltd. — *May 2016- Sept. 2016 @Dalian, China*

SKILLS

- Standardized tests: TOEFL: 105; GRE: 322（Verbal:154, Quantitative:168）
- Programming: Extensive knowledge of Matlab, Python, C, and embedded systems.
- Academics: Outstanding in electrical and mechanical theories, especially mechatronics and modal analysis. Experienced in CADENCE, PSIM, ABAQUS, SolidWorks, COMSOL, and Adobe Softwares.

AWARDS & ACHIEVEMENTS

- The First Prize Scholarship (HEU) — *twice*
- Academic Scholarship (ShanghaiTech) — *twice*
- Excellent Students (HEU, ShanghaiTech) — *2016, 2019*
- Meritorious Winner in Mathematical Contest in Modeling — *2014*