Ata Donmez

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Ankara, Turkiye

EDUCATION

Ph.D. in Mechanical Engineering, The Ohio State University, Columbus, Ohio 8/2018 4/2022
Advisor: Prof. Ahmet Kahraman.
Dissertation Title: *Theoretical and Experimental Investigation of Vibro-Impacts of Drivetrains.*
Sponsor: Gear Research Consortium

M.Sc. in Mechanical Engineering, Middle East Technical University, Ankara, Turkey 2015-2018
Advisor: Prof. Ender Cigeroglu.
Thesis Title: *Nonlinear Vibration Isolation of Inertial Measurement Units.*
Sponsor: Roketsan Aerospace Inc.

B.Sc. in Mechanical Engineering, Middle East Technical University, Ankara, Turkey 2011-2015

PROFESSIONAL EXPERIENCE

Assistant Professor, Department of Mechanical Engineering, 9/25 – present
Bilkent University, Ankara, Turkiye
Leads Structural Dynamics and Nonlinear Phenomena Laboratory (SDNP)
`sdnp.bilkent.edu.tr`

Research Scientist, Department of Mechanical Engineering,
The Ohio State University, Columbus, Ohio 5/23 – 8/25
Develops and conducts applied and basic research projects on nonlinear structural dynamics and vibrations focusing on power transmission and microelectromechanical applications; serves as lead PI or co-PI on sponsored research projects; co-advises graduate research assistants; collaborates with faculty on sponsored research projects.

Post Doctoral Researcher, Gear and Power Transmission Research Lab, 5/22 – 5/23
The Ohio State University, Columbus, Ohio *Performed theoretical and experimental investigation of high-frequency vibro-impact behavior observed in electrified powertrains. Investigated frequency stabilization through 1:2 internal resonance in a nonlinear micro-beam resonator (collaboration with Prof. H. Cho).*

Graduate Research Associate, Gear and Power Transmission Research Lab, 8/18 – 5/22
The Ohio State University, Columbus, Ohio
Developed mathematical models and computationally efficient solution methodologies to handle clearance type non-smooth nonlinearities. Designed a novel experimental set-up with motion control capabilities to be used in model validation efforts and experimental investigations. Participated in the Future Academic Scholars Program of the Department focusing on effective teaching methods in mechanical engineering.

Mechatronic Design Engineer, Roketsan Aerospace, Inc., Ankara, Turkey 6/15 – 8/18
Design and development of precision motion control systems for aerospace applications; design of novel vibration isolation systems for MEMS-based gyroscopes); mathematical modeling of the electric drives to support autopilot development.

RESEARCH PROPOSALS

Host Institute: Bilkent University

- PI, *Dynamics of Electrified Powertrains*, TUBITAK 2232B International Fellowship for Early-Stage Researchers Program, 2025–2028. Status: Awarded.

Host Institute: The Ohio State University

- Co-PI, *(SNITCH): Stable, Nonlinear, and Internal-resonance-enhanced Transducers to Conquer Velocity Hurdles*, DARPA NIMBUS, 02/2025–09/2025. Status: Awarded, I left the project upon moving to another institution in 09/2025.
- Co-PI, *Development of a Dynamic Analysis Software for Deformable Body Dynamics of High-Speed Aerospace Gears*, Pratt & Whitney Engines, 1/2025–12/2025. Status: Completed.
- Co-PI, *Development of a Design Methodology for Friction Dampers in High-speed Gear Systems*, Pratt & Whitney Engines, 1/2025–12/2025. Status: Completed.
- Co-PI, *Deformable-Body Dynamics of High-Speed Aerospace Gears*, Pratt & Whitney Engines, $180,000, 1/2024–12/2024. Status: Completed.
- Co-PI, *Theoretical and Experimental Investigation of Friction Dampers for High-speed Lightweight Gear Systems*, Pratt & Whitney Engines, 1/2024–12/2024. Status: Completed.
- PI, *Design of Electric Vehicle Helical Gear Web Geometries for Optimized Dynamic Performance*, General Motors. Status: Awarded, I left the project upon moving to another institution in 09/2025.

PUBLICATIONS

Journal Papers:

1. T. Ahi, A. Kahraman, **A. Donmez**, "Dynamic Behavior of Helical Gear Pairs: Model and Experiments," to be submitted to *Journal of Mechanical Design*, published online, 2025. 10.1115/1.4070516.
2. **A. Donmez**, M. O'Toole, A. Kahraman, "Lightly loaded vibro-impacts of lubricated gear contacts: Model and experiments," *Proceedings of the Institution of Mechanical Engineers, Part K: Journal of Multi-body Dynamics*, 10.1177/14644193251385976 (2025).
3. **A. Donmez**, H. Cho, "Theoretical Insights into 1:2 and 1:3 Internal Resonance for Frequency Stabilization in Micromechanical Resonators," *Nonlinear Dynamics*, vol. 113, p. 15943–15962 (2025).
4. M. O'Toole, **A. Donmez**, A. Kahraman, "An Experimental and Theoretical Study of Gear Vibro-impacts Caused by Torque Reversals," *ASME Journal of Computational and Nonlinear Dynamics*, vol. 20, p. 081006 (2025).
5. **A. Donmez,** A. Kahraman, "An Investigation of Dynamic Behavior of Electric Vehicle Gear Trains," *ASME Journal of Computational and Nonlinear Dynamics*, vol. 20, p. 021003 (2025).
6. J. Yu, **A. Donmez**, R. Herath, H. Cho, "One-To-Two Internal Resonance in a Micromechanical Resonator with Strong Duffing Nonlinearity," *Journal of Micromechanics and Microengineering*, vol. 34, p. 015007, (2023).
7. **A. Donmez**, C. Thomas, M. Handschuh, A. Kahraman, "Evaluation of Root Stresses of a Rattling Gear Pair," *Mechanical Systems and Signal Processing*, vol. 196, p. 110335 (2023).
8. **A. Donmez**, A. Kahraman, "Experimental and Theoretical Investigation of Influence of Backlash on Geartrains Rattle Noise," *Proceedings of the Institution of Mechanical Engineers, Part K: Journal of Multi-body Dynamics*, vol. 237(1), p. 3–19 (2022).
9. **A. Donmez**, A. Kahraman, "Vibro-Impact Motions of a Three-degree-of-freedom Geartrain Subjected to Torque Fluctuations: Model and Experiments," *ASME Journal of Computational and Nonlinear Dynamics*, vol. 17(12), p. 121002 (2022).

10. **A. Donmez**, A. Kahraman, "A Rattle Noise Severity Index for Multi-mesh Gear Trains Subjected to Torque Fluctuations," *ASME Journal of Vibration and Acoustics*, vol. 145(1), p. 011007 (2022).
11. **A. Donmez**, A. Kahraman, "Influence of Manufacturing Errors on Gear Rattle," *Mechanism and Machine Theory*, vol. 173, p. 104868 (2022).
12. **A. Donmez**, A. Kahraman, "Characterization of Nonlinear Rattling Behavior of a Gear Pair through a Validated Torsional Model," *ASME Journal of Computational and Nonlinear Dynamics*, vol. 17, p. 041006 (2021).
13. **A. Donmez**, A. Kahraman, "Experimental and Theoretical Investigation of Vibro-impact Motions of a Gear Pair Subjected to Torque Fluctuations to Define a Rattle Noise Severity Index," *ASME Journal of Vibration and Acoustics*, vol. 144(4), p. 041001 (2021).
14. A. Celikay, **A. Donmez**, A. Kahraman, "An Experimental and Theoretical Study of Subharmonic Resonances of a Spur Gear Pair," *Journal of Sound and Vibration*, vol. 515, p. 116421 (2021).
15. **A. Donmez**, E. Cigeroğlu, G. Ozgen, "An Improved Quasi-Zero-Stiffness Vibration Isolation System Utilizing Dry Friction Damping," *Nonlinear Dynamics*, vol. 101, p. 107–121 (2020).

Conference Papers and Presentations:

1. A. Donmez, H. Cho, "A Theoretical Investigation of Frequency Stabilization Mechanisms in Micromechanical Resonators through Internal Resonance," *ASME International Design Engineering Technical Conferences, International Conference on Micro- and Nanosystems*, Washington DC, August 25–28, 2024.
2. A. Donmez, A. Kahraman, "A Method of Assessing Rattle Noise Severity from Torsional Drivetrain Models," *International Conference on Mechanical Transmission*, Chongqinq, China, April, 2025.
3. A. Donmez, M. O'Toole, Kahraman, A., "An Investigation of Root Stresses Caused by Drive-Regen Transition Transients," *ASME International Design Engineering Technical Conferences, Power Transmission and Gearing Conference*, Washington DC, August 25–28, 2024.
4. A. Donmez, A. Kahraman, "Vibro-Impacts of a Piecewise-Linear System with a Clearance," *ASME International Design Engineering Technical Conferences, International Conference on Multibody Systems, Nonlinear Dynamics, and Control*, Washington DC, USA, August 25–28, 2024.
5. A. Donmez, Kahraman, A., "A Rattle Noise Index for Multi-mesh Gear Trains," *ASME International Design Engineering Technical Conferences, International Conference on Multibody Systems, Nonlinear Dynamics, and Control*, August 20–23, 2023, Boston, MA.
6. Donmez, A., Kahraman, A., "Vibro-impact Motions of Multi-mesh Gear Trains," *ASME International Design Engineering Technical Conferences, International Conference on Multibody Systems, Nonlinear Dynamics, and Control*, August 20–23, 2023, Boston, MA.
7. A. Donmez, A. Kahraman, M. Handschuh, and M. O'Toole, "An Experimental Investigation of the Effects of Lubrication on Rattling Motions and Noise of a Gear Pair," *ASME IDETC*, Boston, USA, 2023.
8. A. Donmez, A. Kahraman, "Experimental Investigation of Influence of Indexing Errors on Gear Rattle," *VDI International Conference on Gears*, Munich, Germany, September, 2023.
9. A. Donmez, A. Kahraman, "A Generalized Torsional Dynamics Formulation for Multi-Mesh Gear Trains with Clearances and Torque Fluctuations," *ASME International Design Engineering Technical Conferences, International Power Transmission and Gearing Conference*, St. Louis, MO, USA, August, 2022.
10. A. Celikay, A. Donmez, A. Kahraman, "An Experimental Study of Parametric Resonances of a Spur Gear Pair at Speeds Above its Primary Resonance," *VDI International Conference on Gears*, Munich, Germany, September, 2022.
11. A. Donmez, A. Kahraman, "An Experimental Set-up to Investigate Engine Gear Rattle Problems," *Torsional Vibration Symposium*, Salzburg, Austria, 2022.
12. A. Donmez, A. Kahraman, "Development of a Test Set-up to Simulate Engine Gear Rattle

Problems," *International Congress and Exposition on Noise Control Engineering*, Washington, DC, 2021.

13. A. Donmez, E. Cigeroglu, G. Ozgen, "The Effect of Stiffness and Loading Deviations in Nonlinear Isolator Having Quasi-Zero-Stiffness and Geometrically Nonlinear Damping," *ASME International Mechanical Engineering Congress and Exposition*, Florida, 2017.

RESEARCH INTERESTS

- **Deformable-Body Vibrations with Contact:** high-speed dynamic behavior of lightweight aerospace and automotive power transmission systems, robust dynamics contact load distribution computations using frequency-domain techniques.
- **Nonlinear Structural Dynamics:** Nonlinear theories of elasticity, geometrical and material nonlinearities, mechanical contact and friction dynamics, nonlinear resonances, perturbation techniques, reduced-order modeling, nonlinear dynamics of microbeam resonators, vibration control and isolation applications, nonlinear resonances observed in geared systems.
- **Analytical and numerical methods for the analysis of nonlinear dynamical systems:** vibro-impacts of mechanical systems with clearances, bifurcations in non-smooth dynamical systems, chaotic mechanical vibrations, vibration induced noise of machine elements.
- **Experimental mechanics of structural nonlinearities:** design of motion control systems, development of relevant data acquisition systems, gear dynamics experiments, transmission error/vibro-impact measurements, elastomer dynamic characterization.

GRADUATE STUDENT ADVISING

1. Colton Thomas, MS. *An Experimental Methodology for Evaluating Root Stresses of Rattling Gear Pairs*, 2022. Currently with Caterpillar (Advisor: A Kahraman, Co-advisor: A. Donmez)
2. Michael O'Toole, MS. *Experimental Study of Transient Nonlinear Behavior of Electric Vehicle Drivetrains during Drive-Regen Torque Reversals*, 2025. (Advisor: A Kahraman, Co-advisor: A. Donmez).
3. Tahsin Ahi, PhD. *A Theoretical and Experimental Investigation of Helical Gear Dynamics*, Expected to graduate in Spring 2027. (Advisor: A Kahraman, Co-advisor: A. Donmez)
4. Akif Emre Ozturk, MS. *Experimental Characterization of Gear Body Resonances*, Started Spring 2025, (Advisor: A. Donmez)
5. M. Burhan Khan, MS. *Development of an Adaptive Harmonic Balance Method for Systems subjected to Multi-Frequency Excitation*, Started Spring 2025, (Advisor: A. Donmez)

ACHIEVEMENTS AND SERVICE ACTIVITIES

- Member of ASME Technical Committee on Vibration and Sound (TCVS).
- Chair of Conferences Subcomittee in ASME TCVS Industry Liaisons Subcommittee
- Organizer for the joint Symposium on Industrial Applications of Vibration, Acoustics, and Dynamics, ASME International Conference on Multibody Systems, Nonlinear Dynamics, and Control, (2023, 2024, 2025,2026).
- Invited speaker at CAR Research Seminar Series, "Vibro-impact behavior of drivetrains", Center for Automotive Research, The Ohio State University (April 2023).
- Winner of the Young Professionals Grant Competition at 50th International Congress and Exposition on Noise Control Engineering (2021).
- Reviewer for *Nonlinear Dynamics*, *Journal of Sound and Vibration*, *International Journal of Nonlinear Mechanics*, *Journal of Computational and Nonlinear Dynamics*, *Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science*, and *Mechanism and Machine Theory*.
- Recipient of Mechanical Engineering Ph.D. Scholarship at The Ohio State University (2018).