Ata Donmez

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Ankara, Turkiye

EDUCATION

PhD 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

MSc 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.

BSc in Mechanical Engineering, Middle East Technical University, Ankara, Turkey, 2011 – 2015

PROFESSIONAL EXPERIENCE

9/25 – present **Assistant Professor,** Department of Mechanical Engineering, Bilkent University, Ankara, Turkiye.

5/23 – 8/25 **Research Scientist,** Department of Mechanical Engineering, The Ohio State University, Columbus, Ohio.
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.

5/22 – 5/23 **Post Doctoral Researcher**, Gear and Power Transmission Research Laboratory, The Ohio State University, Columbus, Ohio.
Developed tribo-dynamic models and a test machine to investigate the effect of fluid-structure interactions. 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 Professor H. Cho).

8/18 –5/22 **Graduate Research Associate**, Gear and Power Transmission Research Laboratory, 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.

6/15 – 8/18 **Mechatronic Design Engineer**, Roketsan Aerospace, Inc., Ankara, Turkey.
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

DARPA, HARVOS Program

- Co-PI, *(SNITCH): Stable, Nonlinear, and Internal-resonance-enhanced Transducers to Conquer Velocity Hurdles,* NIMBUS, 02/2025-02/2027. Status: Awarded, I left the project upon moving to another institution in 09/2025.

Turkish Research Council

- PI, *Development of Efficient Solution Methodologies for Nonlinear Dynamics of Structures,* 2232B International Fellowship for Early-Stage Researchers Program, 2025. Status: Awarded.

Pratt & Whitney Engines

- Co-PI, *Development of a Dynamic Analysis Software for Deformable Body Dynamics of High-Speed Aerospace Gears*, 1/2025-9/2025. Status: Completed
- Co-PI, *Development of a Design Methodology for Friction Dampers in High-speed Gear Systems*, 1/2025-9/2025. Status: Completed
- Co-PI, *Deformable-Body Dynamics of High-Speed Aerospace Gears*, 1/2024-12/2024. Status: Completed.
- Co-PI, *Theoretical and Experimental Investigation of Friction Dampers for High-speed Light-weight Gear Systems,* 1/2024-12/2024. Status: Completed.

General Motors

- Co-PI, *Design of Electric Vehicle Helical Gear Web Geometries for Optimized Dynamic Performance*, Status: Awarded; I left the project upon moving to another institution.

RESEARCH INTERESTS

- **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.
- **Novel 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.
- **Deformable-Body Contact Mechanics:** high-speed dynamic behavior of light-weight aerospace and automotive power transmission systems, robust dynamics contact load distribution computations using frequency-domain techniques.

TEACHING EXPERIENCE

Mech Eng 341: Dynamics and Control I at Bilkent. Autumn 2025

Mech Eng 2030: Dynamics at Ohio State. Autumn 2022. Co-lectured a class of 155 students with Dr. Kahraman. Designed and organized three recitation sections. Taught selected lectures and one recitation section. Held weekly office hours. Contributed to design and grading of exams.

PUBLICATIONS

[Students co-advised by Dr. Donmez are in *italic*]

Archival Journal Papers:

1. **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).

2. **A. Donmez**, *M. O'Toole,* A. Kahraman, "Vibro-impacts of Lubricated Gear Contacts: Model and Experiments," *IMechE Part K: Journal of Multi-body Dynamics,* accepted for publication (2025).

3. *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*, accepted for publication (2024).

4. **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).

5. J. Yu, **A. Donmez,** R. Herath, H. Cho, "One-To-Two Internal Resonance in a Micro-mechanical Resonator with Strong Duffing Nonlinearity," *Journal of Micromechanics and Microengineering* vol. 34, p.015007, (2023).

6. **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).

7. **A. Donmez**, A. Kahraman, "Experimental and Theoretical Investigation of Influence of Backlash on Geartrains Rattle Noise" *IMechE Part K: Journal of Multi-body Dynamics,* vol. 237(1), p.3-19 (2022).

8. **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).

9. **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).

10. **A. Donmez**, A. Kahraman, "Influence of Manufacturing Errors on Gear Rattle," *Mechanism and Machine Theory,* vol. 173, p. 104868 (2022).

11. **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).

12. **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).

13. 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).

14. **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 IMECE*, Florida, 2017.

GRADUATE STUDENT ADVISING

1. Muhammad Burhan Khan, MSc. Development of a Frequency Domain Formulation to Solve Dynamic Load Distribution Problem, Started in Autumn 2025.
2. Akif Emre Ozturk, MSc. Experimental Investigation of Deformable-Body Gear Resonances, Started in Autumn 2025.
3. Colton Thomas, MSc. An Experimental Methodology for Evaluating Root Stresses of Rattling Gear Pairs, 2022. Currently with Caterpillar (Advisor: A Kahraman, Co-advisor: A. Donmez)
4. Michael O'Toole, MSc. Experimental Study of Transient Nonlinear Behavior of Electric Vehicle Drivetrains during Drive-Regen Torque Reversals, 2025. (Advisor: A Kahraman, Co-advisor: A. Donmez).
5. 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)

ACHIEVEMENTS AND SERVICE ACTIVITIES

- Serve as a coordinator in ASME TCVS Industry Liaisons Subcommittee (2023-Present)
- 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).
- 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, IMechE Journal of Mechanical Engineering Science, and Mechanism and Machine Theory.
- Recipient of Mechanical Engineering Ph.D. Scholarship at The Ohio State University (2018).