

Gokhan Serhat, Ph.D.

Postdoctoral Researcher

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Research Interests

Computational mechanics, finite element analysis, surface haptics, numerical optimization, vibro-acoustics, design of structures & mechanisms



Experience

2019/03 – Present

Postdoctoral Researcher

Max Planck Institute for Intelligent Systems, Department of Haptic Intelligence

Conducting research on the following topics:

- Designing, building, refining, and evaluating a finite-element model that includes a human fingertip interacting with a flat surface that delivers haptic feedback via electroadhesion (also known as electrovibration)
- Improving the quality with which we can deliver high-bandwidth vibrotactile haptic feedback for humans interacting with virtual or remote environments
- Optimizing the design of a large-area fabric-based tactile sensor that employs the measuring principle of electrical resistance tomography to estimate the location and size of all contacts being made with the sensor

2014/04 – 2018/10

Research Assistant

Koc University, Mechanical Engineering Department

Conducted research on the design and optimization of fiber-reinforced composite laminates including the following sub-topics:

- Multi-objective optimization of composite panels for load-carrying and vibro-acoustic requirements
- Design of curved composite panels for optimal free and forced dynamic response
- Advanced formulation methods for the optimization of variable-stiffness laminates

2014/04 – 2016/09

Early Stage Researcher

Marie Curie ITN: AMEDEO

- Conducted research for the Marie Curie Initial Training Network: "Aerospace Multidisciplinarity -Enabling DDesign Optimization" ("AMEDEO")
- Project title: "Multidisciplinary design optimization of a Composite Fuselage Structure with Vibro-Acoustic Requirements"
- Designed composite structures in panel and assembly level incorporating advanced modeling methods and FEM
- Performed multi-objective optimization of composite fuselages for load-carrying and vibro-acoustic requirements

2013/06 – 2013/11

Research Intern

BMW Group AG

- Worked on a M.Sc. thesis project which involved combining finite element analysis and fatigue analysis techniques for the durability calculation of automotive parts
- Thesis title: "Determination of an Analysis Procedure for FEM-Based Fatigue Calculations"

2012/09 – 2013/02 Working Student

MATFEM Partnerschaft

Performed numerical simulations for sheet metal cutting process by:

- Creating finite element models of metal sheets and cutting blades and,
- Developing parametric software packages to automatize the analyses.

2010/07 – 2010/08 Mechanical Engineering Intern

HAVELSAN Inc.

- Designed the fine-tuning mechanism of a laser range finder and created its CAD model,
- Prepared the technical drawings for the base frames of a flight simulator.

Education

2014/04 – 2018/10 Ph.D. in Mechanical Engineering

Koc University

2011/10 – 2013/12 M.Sc. in Computational Mechanics

Technical University of Munich

2007/09 – 2011/07 B.Sc. in Mechanical Engineering

Middle East Technical University

Awards & Scholarships

- Marie Curie Fellowship
- Ranked 1st at the Graduate School of Sciences and Engineering, Koc University (GPA: 4.00 / 4.00)
- Full Ph.D. Scholarship at Koc University
- Graduated with Honors from Middle East Technical University

Skills

Finite element analysis

Applied mathematical modeling

Numerical optimization

Vibro-acoustic analysis

Material modeling

Computer-aided design

Software development

Mechanical design

Software

| | |
|------------|-----------|
| MATLAB | ● ● ● ● ● |
| OptiStruct | ● ● ● ● ● |
| Hypermesh | ● ● ● ● ● |
| ANSYS | ● ● ● ● ● |
| COMSOL | ● ● ● ● ● |
| Nastran | ● ● ● ● ● |
| SolidWorks | ● ● ● ● ● |
| Python | ● ● ● ● ● |

Languages

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|---------|-----------|
| English | ● ● ● ● ● |
| Turkish | ● ● ● ● ● |
| German | ● ● ● ● ● |
| Russian | ● ● ● ● ● |

Journal Articles

- 2020** [Serhat G](#), Anamagh MR, Bediz B, Basdogan I (2020) Dynamic analysis of doubly curved composite panels using lamination parameters and spectral-Tchebychev method. *Accepted for publication in Computers & Structures*
- [Serhat G](#), Bediz B, Basdogan I (2020) Unifying lamination parameters with spectral-Tchebychev method for designing variable-stiffness composite plates. *Composite Structures* 242:112183. doi: 10.1016/j.compstruct.2020.112183
- [Serhat G](#), Kuchenbecker KJ (2020) High-Fidelity Parametric Finite Element Analysis of the Fingertip Pressing into Rigid Surfaces. *Under review*
- 2019** [Serhat G](#), Basdogan I (2019) Multi-objective optimization of composite plates using lamination parameters. *Material & Design* 180:107904. doi: 10.1016/j.matdes.2019.107904
- [Serhat G](#), Basdogan I (2019) Lamination Parameter Interpolation Method for Design of Manufacturable Variable-Stiffness Composite Panels. *AIAA Journal* 57(7):3052–3065. doi: 10.2514/1.J057902
- Gozum MM, [Serhat G](#), Basdogan I (2019) A Semi-Analytical Model for Dynamic Analysis of Nonuniform Plates. *Applied Mathematical Modelling* 76:883–899. doi: 10.1016/j.apm.2019.07.013
- 2018** [Serhat G](#), Basdogan I (2018) Design of Curved Composite Panels for Optimal Dynamic Response Using Lamination Parameters. *Composites: Part B* 147:135–146. doi: 10.1016/j.compositesb.2018.04.033
- Gozum MM, Aghakhani A, [Serhat G](#), Basdogan I (2018) Electroelastic Modeling of Thin Laminated Composite Plates with Surface-bonded Piezo-Patches using Rayleigh-Ritz Method. *Journal of Intelligent Material Systems and Structures* 29(10):2192–2205. doi: 10.1177/1045389X18758189

Conference Papers

- 2020** Lee H, Park H, [Serhat G](#), Sun H, Kuchenbecker KJ (2020) Calibrating a Soft ERT-Based Tactile Sensor with a Multiphysics Model and Sim-to-real Transfer Learning. *Accepted for International Conference on Robotics and Automation (ICRA 2020)*, May 31 – June 4, 2020, Paris, France.
- 2017** Gozum MM, [Serhat G](#) and Basdogan I (2017) Modeling of Variable-Stiffness Composites Using Concatenated Heaviside Functions and Rayleigh-Ritz Method. *In Proceedings of 20th International Conference on Composite Structures (ICCS20)*, September 4 – 7, 2017, Paris, France.
- 2016** [Serhat G](#), Basdogan I (2016) Comparison of Vibro-acoustic Performance Metrics in the Design and Optimization of Stiffened Composite Fuselages. *In Proceedings of INTER-NOISE 2016, 45th International Congress and Exposition on Noise Control Engineering*, August 21 – 24, 2016, Hamburg, Germany.
- [Serhat G](#), Basdogan I (2016) Multidisciplinary Design Optimisation Research Contributions from the AMEDEO Marie Curie Initial Training Network. *In Proceedings of 11th ASMO UK Conference Engineering Design Optimization*, July 18 – 20, 2016, Munich, Germany.
- [Serhat G](#), Basdogan I (2016) Effect of Aspect Ratio and Boundary Conditions on the Eigenfrequency Optimization of Composite Panels using Lamination Parameters. *In Proceedings of 11th ASMO UK Conference Engineering Design Optimization*, July 18 – 20, 2016, Munich, Germany.
- [Serhat G](#), Faria TG, Basdogan I (2016) Multi-Objective Optimization of Stiffened, Fiber-Reinforced Composite Fuselages for Mechanical and Vibro-Acoustic Requirements. *In Proceedings of 17th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, June 13 – 17, 2016, Washington, DC, USA. doi: 10.2514/6.2016-3509

Work-in-Progress Papers

- 2020** [Serhat G](#), Kuchenbecker KJ (2020) Papillary ridges amplify mechanoreceptor strains during normal touch. *Haptic Symposium 2020*, March 28 – 31, 2020, Washington, DC.
- 2019** [Serhat G](#), Kuchenbecker KJ (2019) High-Fidelity Multiphysics Finite Element Modeling of Finger-Surface Interactions with Tactile Feedback. *World Haptics Conference 2019 (WHC 2019)*, July 9 – 12, 2019, Tokyo, Japan.

Teaching & Mentoring

2020/01 – Present

Supervision of a Master's Thesis

Max Planck Institute for Intelligent Systems

- Supervising a graduate student during her 6-months Master's thesis project
- Topic: Design of large-scale novel composite structures to be constructed by filament-winding technology

2019/06 – 2019/08

Supervision of a Research Internship

Max Planck Institute for Intelligent Systems

- Supervised a senior undergraduate student during his 3-months internship
- A pen-like handle was designed, manufactured and assembled to a maglev haptic device for rendering vibrations

2014/04 – 2018/10

Teaching Assistant

Koc University

- Performed problem solving and lab sessions
- Graded exams, homework and projects
- Courses: Theory of Vibration, Mechanical Engineering Lab, Heat Transfer, Thermodynamics

2015/06 – 2016/04

Supervision of a Research Project

Koc University

- Supervised the project: "Optimization of Composite Panels for Vibro-acoustic Requirements" (co-researcher: Tiago Goncalves Faria)
- Published a conference paper in AIAA 2016 Conference

2017/10 – 2018/01

Supervision of a Senior Design Project

Koc University

- Supervised 2 undergraduate students working on the "Mechanical Engineering Design" course project
- Topic: Application of acoustic meta-materials to the plates for vibration suppression
- A meta-material sound proofing box was designed using FEA to attain higher performance compared to an ordinary box of same weight
- The produced box yielded over 10 dB decrease in the measured sound pressure levels for certain frequencies

References

- Katherine J. Kuchenbecker, Max Planck Institute for Intelligent Systems, Director, kjk@is.mpg.de, *Postdoc Advisor*
- Ipek Basdogan, Koc University, Associate Professor, ibasdogan@ku.edu.tr, *Ph.D. Thesis Advisor*
- Bekir Bediz, Sabanci University, Assistant Professor, bbediz@sabanciuniv.edu, *Ph.D. Thesis Committee Member & Collaborator*
- Fabian Duddleck, Technical University of Munich, Professor, duddleck@tum.de, *M.Sc. Thesis Advisor*
- Helmut Gese, MATFEM Partnerschaft, Ph.D., helmut.gese@matfem.de, *Manager*
- Cagatay Basdogan, Koc University, Professor, cbasdogan@ku.edu.tr, *Professor*

Miscellaneous Projects

2016/07 – Present

Development of an In-House Finite Element Analysis Software

Project related to Ph.D. study and postdoctoral work

- Developed an FEA program with GUI in MATLAB with a model generator and a solid/shell element-based solver
- Incorporated lamination parameters formulation into the software for the analysis of composite panels
- Currently implementing contact mechanics and friction models

2016/06 – 2017/08

Design of a Novel Bone Fixator Mechanism for Osteotomy Operations

Individual Project

- Designed a bone fixator mechanism for osteotomy operations and developed its method of use (Patent application pending)

2012/07 – 2012/10

Inverse CFD Identification of Pollutant Sources within the Urban Street Canyons Depending on Few Sensors

Project for the Master's program course: "Software Lab"

- Completed a programming project aiming to determine the source locations for a scalar quantity distribution in fluid media
- Developed a script which uses final state of the distribution and boundary conditions as the input and predicts the location of the sources as the output