

ERVA ULU

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RESEARCH INTERESTS

My research interests include *computational design, design optimization, design for fabrication, computer graphics, machine learning* and *data-driven design*.

PROFESSIONAL EXPERIENCE

Palo Alto Research Center

June 2018 - Present

Research Scientist, System Sciences Lab

- Developed computational design tools to improve additive manufacturability of arbitrary 3D geometries
- Developed novel shape/field representations for efficient optimization of complex shapes and heterogeneous material designs
- Developed a novel interactive support structure design method for additive manufacturing
- Led graduate summer interns
- Contributed to proposals seeking for government funding

Carnegie Mellon University

Aug 2013 – May 2018

Research Assistant, Visual Design and Engineering Lab, Graphics Lab

- Developed shape and process optimization methods to enhance structural performance of additively manufactured objects
- Developed novel shape representations for efficient optimization of complex 3D models
- Developed surrogate models to efficiently search highly complex design domains for problems involving costly physics analysis
- Led graduate and undergraduate researchers
- Contributed to proposals seeking for government funding

Disney Research Pittsburgh

Aug 2016 – May 2017

Lab Associate

- Developed a machine learning model to automatically build micro-scale LEGO models

Siemens Corporate Research

May 2016 – Aug 2016

Research Intern, Product Simulation & Modeling Group

- Developed a 3D shape segmentation method for hybrid manufacturing process planning

Siemens Corporate Research

May 2015 – Aug 2015

Research Intern, Product Simulation & Modeling Group

- Developed a data-driven approach to learn human grasps or arbitrary 3D objects for natural looking simulations

Aselsan Inc.

Aug 2012 – Aug 2013

R&D Engineer, Unmanned Systems Department

- Designed control algorithms for stabilization of unmanned defense systems under high-frequency environmental disturbances

Bilkent University

Sept 2010 – Aug 2012

Research Assistant, Smart Mechatronic Systems Lab

- Designed a modular 3D nano-positioning system
- Developed a novel adaptive method to improve resolution of quadrature encoder signals
- Designed novel learning based cross-coupled control algorithms for multi-axis nano-positioning devices

EDUCATION

Carnegie Mellon University

Aug 2013 – May 2018

Ph.D. Candidate in Mechanical Engineering Department (GPA: 4.0/4.0)

Thesis: Enhancing the structural performance of additively manufactured objects

Advisor: L. Burak Kara

Bilkent University

Sept 2010 – Aug 2012

M.Sc. in Mechanical Engineering Department (GPA: 3.80/4.0)

Thesis: Mechatronic design of a modular three-axis slider system for high precision positioning applications

Advisor: Melih Cakmakci

Pennsylvania State University

Aug 2009 – Dec 2009

Exchange Program in Mechanical Engineering Department (GPA: 4.0/4.0)

Middle East Technical University

Sept 2006 – Jun 2010

B.Sc. in Mechanical Engineering Department (GPA: 3.72/4.0)

PUBLICATIONS

N. Gecer Ulu, S. Korneev, **E. Ulu** and S. Nelaturi (2020). Sliding Basis Optimization for Heterogeneous Material Design. *The Symposium on Solid and Physical Modeling (SPM)*. (Accepted)

E. Ulu, N. Gecer Ulu, W. Hsiao and S. Nelaturi (2019). Manufacturability Oriented Model Correction and Build Direction Optimization for Additive Manufacturing. *ASME Journal of Mechanical Design*.

E. Ulu, J. McCann and L. B. Kara (2019). Structural Design Using Laplacian Shells. *Computer Graphics Forum (In Symposium on Geometry Processing (SGP))*.

E. Ulu, R. Huang, L. B. Kara and K.S. Whitefoot (2019). Concurrent Structure and Process Optimization for Minimum Cost Metal Additive Manufacturing. *ASME Journal of Mechanical Design*.

E. Ulu (2018). Enhancing the Structural Performance of Additively Manufactured Objects. *Doctoral Dissertation, Carnegie Mellon University, Pittsburgh, PA*.

Y. Wang, **E. Ulu**, A. Singh and L. B. Kara (2018). Efficient Load Sampling for Worst-Case Structural Analysis Under Force Location Uncertainty. *ASME IDETC, Quebec City, Canada*.

E. Ulu, J. McCann and L. B. Kara (2017). Lightweight Structure Design Under Force Location Uncertainty. *ACM Transactions on Graphics (SIGGRAPH 2017)*.

R. Huang, **E. Ulu**, L. B. Kara and K.S. Whitefoot (2017). Cost Minimization in Metal Additive Manufacturing Using Concurrent Structure and Process Optimization. *ASME IDETC, Cleveland, OH*.

E. B. Arisoy, G. Ren, **E. Ulu**, N. Gecer Ulu and S. Musuvathy (2016). A Data-driven Approach to Predict Hand Positions For Two-Hand Grasps of Industrial Objects. *ASME IDETC, Charlotte, NC. (Best Paper Award)*

N. Gecer Ulu, **E. Ulu**, and M. Cakmakci (2016). Design and Analysis of A Modular Learning Based Cross-Coupled Control Algorithm for Multi-Axis Precision Positioning Systems. *International Journal of Control Automation and Systems*.

E. Ulu, E. Korkmaz, K. Yay, O. B. Ozdoganlar, and L. B. Kara (2015). Enhancing the Structural Performance of Additively Manufactured Objects Through Build Orientation Optimization. *ASME Journal of Mechanical Design, Special Issue: Design for Additive Manufacturing*.

E. Ulu, R. Zhang, and L. B. Kara (2015). A Data-Driven Investigation and Estimation of Optimal Topologies Under Variable Loading Configurations. *Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization*. (Extended version of CompImage'14)

E. Ulu, R. Zhang, M. E. Yumer, and L. B. Kara (2014). A Data-Driven Investigation and Estimation of Optimal Topologies Under Variable Loading Configurations. *Computational Modeling of Objects Presented in Images: Fundamentals, Methods, and Applications (CompIMAGE'14)*, Pittsburgh, PA.

E. Ulu, N. Gecer Ulu, and M. Cakmakci (2014). Development and Validation of an Adaptive Method to Generate High-Resolution Quadrature Encoder Signals. *ASME Journal of Dynamic Systems, Measurement, and Control*.

E. Ulu (2012). Mechatronic Design of a Modular Three-Axis Slider System for High-Precision Positioning Applications. *Master's Thesis, Bilkent University, Ankara, Turkey*.

E. Ulu, N. Gecer Ulu, and M. Cakmakci (2012). Adaptive Correction and Look-up Table Based Interpolation of Quadrature Encoder Signals. *ASME Dynamic Systems and Control Conf. (DSCC 2012)*, Ft. Lauderdale, FL.

N. Gecer Ulu, **E. Ulu**, and M. Cakmakci (2012). Learning Based Cross-Coupled Control for Multi-Axis High Precision Positioning Systems. *ASME Dynamic Systems and Control Conf. (DSCC 2012), Ft. Lauderdale, FL. (Best Paper Award)*

N. Gecer Ulu, **E. Ulu**, S. Filiz, and M. Cakmakci (2012). Development of a Modular Single-Axis Slider System for High Precision Positioning Applications. *The 15th International Conference on Machine Design and Production, Denizli, Turkey.*

PATENTS

E. Ulu, N. Gecer Ulu, W. Hsiao, and S. Nelaturi (2020). *Ensuring Additive Manufacturability of Object Model Using Meso-skeleton Analysis. (Pending).*

E. Ulu, N. Gecer Ulu, W. Hsiao, and S. Nelaturi (2020). *System and Method for Determining Spatial Distribution of Variable Deposition Size in Additive Manufacturing. (Pending).*

N. Gecer Ulu, S. Korneev, **E. Ulu** and S. Nelaturi (2020). *Spatial Field Optimization with Reduced Parameters. (Pending).*

E. Ulu, E. B. Arisoy, S. Musuvathy, D. Madeley and N. Gecer Ulu (2018). *Build Direction-Based Partitioning for Construction of a Physical Object Through Additive Manufacturing. (WO2018191034A1).*

E. B. Arisoy, S. Musuvathy, **E. Ulu**, and N. Gecer Ulu (2017). *Methods and System to Predict Hand Positions for Multi-Hand Grasps of Industrial Objects. (WO2017132134A1).*

MEDIA

Phys.org – [Lightening the Load.](#)

Carnegie Mellon University - [Engineers Aim To Lighten the Load for Manufacturers.](#)

Phys.org – [Lighter Weights, Lower Costs In Additive Manufacturing.](#)

Treehugger – [Optimizing Additive Manufacturing For 3-D Printing Stronger, Lighter Parts.](#)

IEEE GlobalSpec – [Watch This: Structural Optimization for Additive Manufacturing.](#)

Carnegie Mellon University – [Lighter Weights, Lower Costs In 3D Printing.](#)

TEACHING EXPERIENCE

Carnegie Mellon University, Mechanical Engineering Department Jan 2015 – Jan 2016
Teaching Assistant, Engineering Design II

Bilkent University, Mechanical Engineering Department Sept 2010 – Jun 2012
Teaching Assistant, Fundamentals of Mechanical Engineering
Teaching Assistant, Introduction to Systems Engineering
Teaching Assistant, Mechanics and Materials II

FELLOWSHIPS & AWARDS

David Barakat and LaVerne Owen-Barakat Fellowship	2016
Milton Shaw PhD Student Travel Award, Carnegie Mellon University	2015
International Scientific Research Incentive Award, TUBITAK	2014
Graduate Fellowship, Carnegie Mellon University	2013-2018
Student Travel Grant, ASME Dynamic Systems and Control Conference 2012	2012
Graduate Fellowship of Scientific and Technical Research Council of Turkey	2010 - 2012
Full Scholarship for MSc., Bilkent University	2010 - 2012
Dean's List, Pennsylvania State University	2009
Dean's High Honor List, Middle East Technical University	2006 – 2010

TECHNICAL SKILLS

Programming - C++, Matlab, Python

CAD Tools - Solidworks, NX, Autodesk Inventor, ANSYS Mechanical APDL

Simulation - NI Labview, Matlab Simulink and SimMechanics

PROFESSIONAL SERVICE

Reviewer – Eurographics

Computer Graphics Forum

Computer-Aided Design

Journal of Computing and Information Science in Engineering

International Design Engineering Technical Conferences & Computers and Information in Engineering

Conference

IEEE/ASME Transactions on Mechatronics

IEEE American Control Conference

ASME Dynamic Systems and Control Conference

PHD COURSEWORK

Computational Aspects of Fabrication

Computer Graphics

Finite Element Methods in Mechanics

Computer Aided Design

Applied Fabrication Techniques for HCI

Computer Graphics Seminar

Introduction to CAD/CAE Tools