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. (Under Review).*

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. (Under Review).*

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

E. Ulu*, E. B. Arisoy, S. Musuvathy, and N. Gecer Ulu (2017). System and Method for Build Orientation Based Volumetric Segmentation. (Under Review).*

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. *(WO2017132134 A1).*

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