Jianzhe Gu

PH.D STUDENT · HCI RESEARCHER

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Research Interests

Computational Design, Human-Computer Interaction, Deep Learning, Digital Fabrication

Education

Ph.D. in Human-Computer Interaction *(in progress)* — *Aug. 2018 - Present*

CARNEGIE MELLON UNIVERSITY, SCHOOL OF COMPUTER SCIENCE — *Pittsburgh, PA, USA*

- Advisor: Lining Yao

B.S. in Electrical and Computer Engineering — *Sept. 2014 - Apr. 2018*

SHANGHAI JIAO TONG UNIVERSITY, SCHOOL OF INFORMATION AND ELECTRICAL ENGINEERING — *Shanghai, China*

- Advisor: Xinbing Wang

Publications

PEER-REVIEWED CONFERENCE PAPERS

[SCF 2020] **Inverse Design Tool for Asymmetrical Self-Rising Surfaces with Color Texture**
Jianzhe Gu, Vidya Narayanan, Guanyun Wang, Danli Luo, Harshika Jain, Kexin Lu, Fang Qin, Sijia Wang, James McCann, and Lining Yao
In Symposium on Computational Fabrication. ACM.

[UIST 2020] **E-seed: Shape-Changing Interfaces that Self Drill**
Danli Luo, **Jianzhe Gu**, Fang Qin, Guanyun Wang, and Lining Yao
In Proceedings of the 33rd Annual ACM Symposium on User Interface Software and Technology

[UIST 2020] **SimuLearn: Fast and Accurate Simulator to Support Morphing Materials Design and Workflows**
Humphrey Yang, Kuanren Qian, Haolin Liu, Yuxuan Yu, **Jianzhe Gu**, Matthew McGehee, Yongjie Jessica Zhang, and Lining Yao
In Proceedings of the 33rd Annual ACM Symposium on User Interface Software and Technology

[CAD 2020] **Material characterization and precise finite element analysis of fiber reinforced thermoplastic composites for 4D printing**
Yuxuan Yu, Haolin Liu, Kuanren Qian, Humphrey Yang, Matthew McGehee, **Jianzhe Gu**, Danli Luo, Lining Yao and Yongjie Jessica Zhang
Computer-Aided Design 2020

[CHI 2019] **Geodesy: Self-rising 2.5D Tiles by Printing along 2D Geodesic Closed Path**
Jianzhe Gu, David E. Breen, Jenny Hu, Lifeng Zhu, Ye Tao, Tyson Van de Zande, Guanyun Wang, Yongjie Jessica Zhang, and Lining Yao
In Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems

[UIST 2018] **4DMesh: 4D Printing Morphing Non-Developable Mesh Surfaces**
Guanyun Wang, Humphrey Yang, Zeyu Yan, Nurcan Gecer Ulu, Ye Tao, **Jianzhe Gu**, Levent Burak Kara, and Lining Yao
In Proceedings of the 31st Annual ACM Symposium on User Interface Software and Technology

[CHI 2018] **Printed Paper Actuator: A Low-cost Reversible Actuation and Sensing Method for Shape Changing Interfaces**
Guanyun Wang, Tingyu Cheng, Youngwook Do, Humphrey Yang, Ye Tao, **Jianzhe Gu**, Byoungkwon An, and Lining Yao
In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems

[CHI 2018] **Thermorph: Democratizing 4D printing of self-folding materials and interfaces**
Kwon An, Ye Tao, **Jianzhe Gu**, Tingyu Cheng, Anthony Chen, Xiaoxiao Zhang, Wei Zhao, Youngwook Do, Shigeo Takahashi, Hsiang-Yun Wu, Teng Zhang, and Lining Yao
In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems

Demonstrations and Posters

[CHI EA'20] **4DTexture: A Shape-Changing Fabrication Method for 3D Surfaces with Texture**
Lingyun Sun, Jiaji Li, Yu Chen, Yue Yang, Ye Tao, Guanyun Wang, and Lining Yao
In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems

Research Experience

Computational 4D Printing (advised by Lining Yao and Jim McCann) *Aug. 2018 - 2020*
Human-Computer Interaction Institute, Carnegie Mellon University *Pittsburgh, PA, USA*

With optimized printing tool paths and local layer height, 3D printed flat sheets can self-transform into 3D shapes under heat. By viewing 3D printing as a programming system, we encode the internal morphing energy into the material through basic machine operations. We built an end-to-end tool that optimized the printing G-code to enable flat sheets to self-transform into arbitrary input height field. The tool flattens the height field into a 2D layout with stress information using a geometry-based optimization algorithm, and computes printing tool paths with a local path planning algorithm. Such a system enables rapid prototyping, flat-packaging and self-deployment.

Haptic Origami (adviced by Lining Yao) *April. 2020 - Present*
Human-Computer Interaction Institute, Carnegie Mellon University *Pittsburgh, PA, USA*

The research is focusing on building an AI-generated elastic-origami-based haptic feedback system that generates force-displacement feedback by designing specific origami structures. Using pattern-generation graph network and a differentiable simulator, the system will design an optimized origami pattern for a specific 2D force feedback. Users can move around a joystick fixed on a half-folded origami, and sense a varying 2D force diagram.

Service

Paper Reviewing **CHI** (2019), **UIST** (2019-2020)

Courses & Technical Skills

Programming	**Python**, **C/C++**, **Javascript**, Objective-C, Matlab, LaTeX
Frameworks	Tensorflow, Pytorch, OpenGL, Eigen
Tools	Unix/Linux, Adobe Illustrator, Blender, Rhino/Grasshopper
Courses	Deep Learning, Deep Reinforcement Learning, Convex Optimization, Computer Graphics, Discrete Differential Geometry, Optimal Control