Benjamin Jenett CV

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Updated 09/2020

Personal/academic website: https://bej.pages.cba.mit.edu/personal/

Statement: I am interested in reducing to practice advanced material systems and manufacturing methods. Specifically, I want to combine theoretical and practical design aspects to generate new architected materials, I want to design and implement robotic platforms to automate their production, and test novel applications in fields such as transportation, aviation, and infrastructure.

Current position

Discrete Lattice Industries, LLC — Seattle, WA

Founder — Aug 2020-present

DLI will produce on-demand, discrete lattice materials and systems at the architectural scale and beyond.

Education

Massachusetts Institute of Technology — Cambridge, MA

Doctor of Philosophy - Media Arts and Sciences — 2015-2020

Research Group: Center for Bits and Atoms (http://cba.mit.edu/), Director: Prof. Neil Gershenfeld

Thesis Title: *Discrete Mechanical Metamaterials*

Thesis document: https://bej.pages.cba.mit.edu/home/Jenett-PhD-MAS-2020b.pdf

Thesis defense video: https://vimeo.com/444864161/d709729a56

Masters of Science - Civil Engineering — 2013-2015

Thesis Title: *Digital Material Aerospace Structures*

Thesis document: https://dspace.mit.edu/handle/1721.1/101837

UC Berkeley — Berkeley, CA

Bachelors of Architecture — 2003-2007

Awards

NASA Space Technology Research Fellowship (NSTRF) — 2014-2018

Full academic funding for research of on-orbit robotic assembly of space structures.

Patents

Pending

1. *Method for discrete assembly of cuboctahedron lattice materials*, provisional filed 11/2019, converting 09/2020.

Awarded

2. *Discrete assemblers with conventional motion systems*, #US10155313B2, granted 12/2018
3. *Digital material assembly by passive means and modular isotropic lattice extruder system*, #US10145110B2, granted 12/2018
4. *Bipedal isotropic lattice locomoting explorer: robotic platform for locomotion and manipulation of discrete lattice structures and lightweight space structures*, #US10046820B2, filed 06/2017, published 12/2017
5. *Mobile Robot for Locomotion Through a 3-D Periodic Lattice Environment*, #US20190118390A1, filed 09/2018, published 04/2019.

Publications

Journals

1. **B. Jenett**, et al., "Discretely Assembled Mechanical Metamaterials", (under review) Pre-publication draft: https://bej.pages.cba.mit.edu/home/abc9943_combined.pdf
2. **B. Jenett,** et al, **"**Material-Robot System for Assembly of Discrete Cellular Structures" *IEEE Robotics and Automation Letters*, (2019). http://cba.mit.edu/docs/papers/19.07.materialrobot.pdf
3. N. Cramer, D. Cellucci, O. Formoso, C. Gregg, **B. Jenett**, et al, "Elastic Shape Morphing of Ultralight Structures by Programmable Assembly", *Smart Materials and Structures*, (2019). http://cba.mit.edu/docs/papers/19.03.MADCAT.pdf
4. **B. Jenett**, et al "Digital Morphing Wing: Active Wing Shaping Concept Using Composite Lattice-Based Cellular Structures", *Soft Robotics*, (2016). http://cba.mit.edu/docs/papers/16.11.SoRo.pdf

Publications (continued)

Conferences

1. A. Costa, A. Abdel-Rahman, **B. Jenett,** et al. "Algorithmic Approaches to Reconfigurable Assembly Systems", *IEEE Aerospace Conference*, (2019). http://cba.mit.edu/docs/papers/19.02.algoreconfig.pdf
2. **B. Jenett**, et al. "Discrete Lattice Material Vacuum Airship", *AIAA SciTech*, (2019). http://cba.mit.edu/docs/papers/19.01.vacuum.pdf
3. **B. Jenett**, et al "Building Block-based Assembly of Scalable Metallic Lattices", *ASME MSEC*, (2018). http://cba.mit.edu/docs/papers/18.06.msec.metal.pdf
4. **B. Jenett,** et al, "Design of Multifunctional Hierarchical Space Structures", *IEEE Aerospace*, (2017). http://cba.mit.edu/docs/papers/17.05.HierarchSpaceStruct.pdf
5. **B. Jenett**, et al, "BILL-E: Robotic Platform for Locomotion and Manipulation of Lightweight Space Structures", *Proc. 2017 AIAA SciTech*, (2017). http://cba.mit.edu/docs/papers/17.06.scitech.bille.pdf
6. **B. Jenett**, et al. "A Mobile Robot for Locomotion through a 3D Periodic Lattice Environment", *Proc. 2017 IEEE International Conference on Robotics and Automation (ICRA*), (2017). http://cba.mit.edu/docs/papers/17.06.icra.mojo.pdf
7. **B. Jenett**, et al. "Meso-Scale Digital Material: Modular, Reconfigurable, Lattice-Based Structures", *Proc. 2016 ASME MSEC* (2016). http://cba.mit.edu/docs/papers/16.07.msec.bridge.pdf

Press Coverage

"Assembler robots make large structures from little pieces" 2019

MIT News https://news.mit.edu/2019/robots-large-structures-little-pieces-1016
Popular Mechanics https://www.popularmechanics.com/technology/robots/a29501928/assembler-robots-mit/

"MIT and NASA engineers demonstrate a new kind of airplane wing" 2019

MIT News https://news.mit.edu/2019/engineers-demonstrate-lighter-flexible-airplane-wing-0401
Newsweek https://www.newsweek.com/nasa-radical-airplane-wing-1381782

"A new twist on airplane wing design" 2016

MIT News https://news.mit.edu/2016/morphing-airplane-wing-design-1103
WSJ https://www.wsj.com/articles/mit-engineers-develop-a-flexible-wing-1478296115

Work experience

Nous Engineering (www.nousengineering.com) Los Angeles, CA

Engineer 2012-2013

Structural engineering for buildings and architectural installations
Simulation using various FEA packages, calculation of member/connection design

Ball-Nogues Studio (www.ball-nogues.com) Los Angeles, CA

Project Manager 2009-2012

CAD/CAM of various wood/steel/composite structures for large-scale public art projects
Planning, staging, and on-site installation using industrial lifting and fixturing systems

Lundberg Design (www.lundbergdesign.com) San Francisco, CA

Designer/Fabricator 2008-2009

Machining/Fabrication of custom architectural features (wood, aluminum, steel, glass)

Skills

Hardware

Manufacturing: CNC (5/3 axis mill, lathe, waterjet, laser, EDM, Zund); Additive manufacturing (garden variety), injection molding.
Mechatronics: design and fabrication of robotic motion systems including actuation, power, sensors, end effectors, etc.
Characterization: instrumentation, data acquisition, and post-processing using large scale mechanical testing platforms.

Software

CAD: Rhino 3D, Solidworks, Fusion 360, some CATIA
FEA: ANSYS, Abaqus, Oasys GSA, native CAD simulation environments
Programming: Python for data processing/simulation, Javascript for custom workflows, C/C++/Arduino for robotics

Biography

Born and raised in Southern California, Ben's exposure to design, engineering, and fabrication in his undergraduate studies at UC Berkeley led to a position at a design/build architecture firm in San Francisco. Having honed metal and wood fabrication skills, he then moved to Los Angeles to pursue large scale digital fabrication as a project manager with Ball Nogues studio. Following this, he worked as a structural engineer at Nous, before entering a Master's of Science program in Civil Engineering at MIT. There, he was awarded a NASA Space Technology Research Fellowship, which allowed him to focus on advanced structural concepts and robotic assembly systems.

After completing his SM, he began his doctoral studies at the Center for Bits and Atoms, advised by Prof. Neil Gershenfeld. There, he developed, prototyped, tested, and implemented several novel research concepts, including a low-cost, highly tailorable mechanical metamaterial system based on discrete assembly, multiple mobile robotic platforms for assembly, inspection, and repair of these structures, and application-specific systems for transportation and aerospace in collaboration with industry partners including Toyota, Airbus, and Nike. He has published in several journals on these topics and holds multiple patents on the core technologies. Having completed his PhD in August 2020, he is currently living in Seattle, WA with his wife and dog, and is developing a start-up to commercialize lattice production based on the technologies developed at MIT.

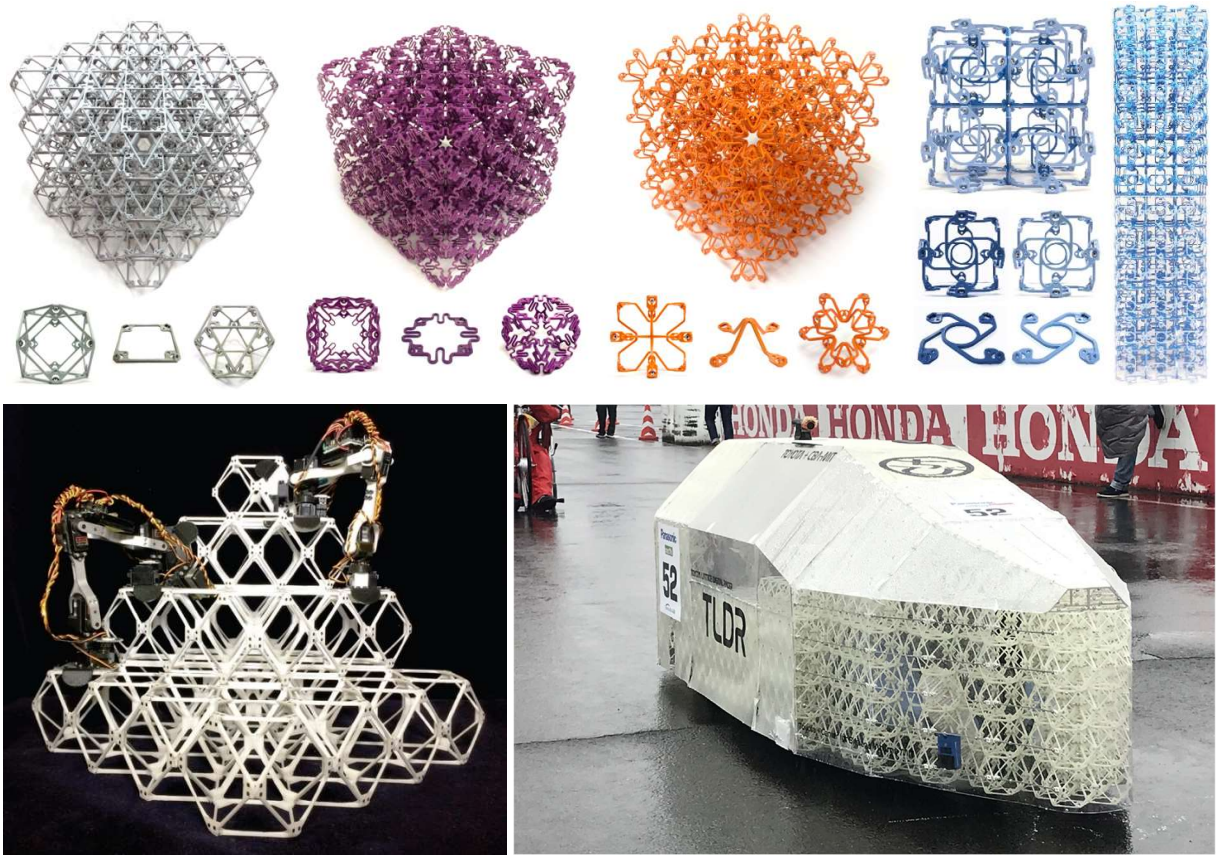

Figure 1: Research Summary. Top: Discrete mechanical metamaterials, bottom: (L) mobile robotic assembly, (R) cellular supermileage vehicle