SAMUEL LENSGRAF

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EDUCATION

Dartmouth College *September 2018 - August 2024 (expected)*
Ph.D. in Computer Science *Advised by: Devin Balkcom and Alberto Quattrini Li*
Thesis: "Towards Scalable Autonomous Underwater Construction with Free-Floating Robots"

Tulane University (Cum Laude) *September 2011 - May 2015*
B.S. in Math & Computer Science *Advised by: Ramgopal Mettu*
Capstone project: Spatial decomposition datastructures for FDM printing

AWARDS & FUNDING

NSF GRFP Fellowship for autonomous underwater construction research. (Approximately $120,000) 2019 - 2024
Best Automation Paper ICRA 2016 for "Beyond layers: A 3D-aware toolpath algorithm for fused filament fabrication" ($1000) 2016
Third Best Paper ICRA 2022 Construction Robotics workshop ($250) 2022
Third Best Poster Dartmouth Innovation and Technology Festival 2022

RESEARCH INTERESTS

Autonomous construction & fabrication How can we design fabrication systems that can build accurate structures at scale? How can we autonomously fabricate structures in adverse domains with limited human supervision?

Planning algorithms Planning for mobile manipulation and construction introduces complex precedence and reachability constraints. How can we design algorithms that return feasible, efficient plans for autonomous construction?

Computational design What is the trade-off between physical and algorithmic complexity in manipulation systems? Can we design geometries that encode manipulation behaviors computationally?

Experimental field robotics Do techniques developed to improve robot behavior in the lab work well in the field? What design features of perception and control algorithms commonly lead to robust field deployments?

TEACHING ASSISTANT EXPERIENCE

Dartmouth College

COSC 010	Problem Solving via Object Oriented Programming	*Fall 2019*

Tulane University

CMPS 1500	Introduction to Computer Science I	*Fall 2014*
CMPS 1500	Introduction to Computer Science I	*Fall 2013*

OUTREACH & MENTORSHIP

Research Mentorship *September 2018 - Present*

- *Masters students:* Ziang Ren (automatic exposure control for field robots)
- *Undergraduate students:* Aiwei Zhang (visual odometry for underwater construction), Karim Itani (kinematics for rigid body chains), Eren Aldemir (experimental support for underwater construction)
- *Highschool students:* Zachary Zitzewitz (interface design for underwater construction robot), Quentin Baumann (design of interlocking blocks)

Graduate Student Council Representative *May 2022 - June 2023*
Science Day at Dartmouth activity host *April 2023*
Women in STEM Talaria Mentorship Program *May 2022 - September 2022*
Judge for Women in STEM ENVISION research competition *Feburary 2022 - March 2022*
Women in STEM STEM World outreach talk *2019*
Founder of Tulane Student Computer Science Club (called Cookies & Code) *2014*

INDUSTRY EXPERIENCE

Team Lead: Marketplace Dynamics *January 2018 - July 2018*
Bellhops LLC

- Led a four person full stack team of developers to deliver products which organized the business of linking movers with people who needed to move.

Software Engineer *June 2015 - January 2018*
Bellhops LLC

- Designed and implemented one of the first AI-enabled decision making system deployed at Bellhop which automatically built work schedules for Bellhop service providers, saving hundreds of call center hours. This project was featured in a successful series C slide deck resulting in a $31,000,000 funding round.

PATENTS

Samuel Lensgraf, Ramgopal R. Mettu, "Method and system for rapid and efficient three-dimensional printing" *2017*

PROFESSIONAL COMMITTEES

Dartmouth council on computing 2022-2023
Discussed university policies on computational resources including generative AI.
Program committee member AAAI 2023
Graduate student council 2020-2022
Served on service committee to help organize service events with the New Hampshire Haven.
Reviewer for ICRA 2023
Reviewer for ICRA Underwater Active Perception Workshop 2021

ROBOTICS HARDWARE

Droplet Autonomous Underwater Vehicle (AUV) A low cost, open-sourced AUV platform I designed for underwater manipulation research.

MiniAHRS I built a Linux driver to integrate the miniAHRS into the Droplet platform.

BlueROV I'm experienced with modifying the standard BlueROV for autonomous research tasks. I'm experienced at running it with and without tether in the field.

BlackflyS Computer Vision Camera I worked with a masters student to develop an exposure control method for this camera, leading to an experimental robotics publication (ISER 2023).

Hardware Fabrication I've built and fabricated a custom manipulator, fabricated chassis components for surface and underwater robots, and modified hardware to accommodate new sensors using 3D printing and CNC machining.

Field Deployments I've deployed underwater robot systems in ocean and in-land remote locations. I'm confident SCUBA diving to deploy field robots.

REFEREED CONFERENCE PUBLICATIONS

1. Ziang Ren, **Samuel Lensgraf**, Alberto Quattrini Li, "Improving the perception of visual fiducial markers in the field using Adaptive Active Exposure Control" *(accepted)* ISER 2023

2. **Samuel Lensgraf**, Devin Balkcom, Alberto Quattrini Li, "Buoyancy enabled autonomous underwater construction with cement blocks", ICRA 2023
3. **Samuel Lensgraf**, Amy Sniffen, Zachary Zitzewitz, Evan Honnold, Jennifer Jain, Weifu Wang, Alberto Quattrini Li, Devin Balkcom, "Droplet: Towards Autonomous Underwater Assembly of Modular Structures", RSS 2021
4. Charles J Carver, Qijia Shao, **Samuel Lensgraf**, Amy Sniffen, Maxine Perroni-Scharf, Hunter Gallant, Alberto Quattrini Li, Xia Zhou, "Sunflower: locating underwater robots from the air", MobiSys 2022
5. Amy Sniffen, Zezhou Sun, **Samuel E Lensgraf**, Emily Whiting, Alberto Quattrini Li, Devin Balkcom, "Falling Into Place: Drop Assembly of Interlocking Puzzles", RSS 2021
6. **Samuel Lensgraf**, Karim Itani, Yinan Zhang, Zezhou Sun, Yijia Wu, Alberto Quattrini Li, Bo Zhu, Emily Whiting, Weifu Wang, Devin Balkcom, "PuzzleFlex: kinematic motion of chains with loose joints", ICRA 2020
7. Mingi Jeong, Monika Roznere, **Samuel Lensgraf**, Amy Sniffen, Devin Balkcom, Alberto Quattrini Li, "Catabot: Autonomous surface vehicle with an optimized design for environmental monitoring", Oceans 2020
8. Chanyeol Yoo, **Samuel Lensgraf**, Robert Fitch, Lee M. Clemon, Ramgopal Mettu, "Toward Optimal FDM Toolpath Planning with Monte Carlo Tree Search" ICRA 2020
9. **Samuel Lensgraf**, Ramgopal R. Mettu, "Incorporating Kinematic Properties into Fused Deposition Toolpath Optimization", ICRA 2018
10. **Samuel Lensgraf**, Ramgopal R. Mettu, "An improved toolpath generation algorithm for fused filament fabrication", ICRA 2017
11. **Samuel Lensgraf**, Ramgopal R. Mettu, Beyond layers: A 3D-aware toolpath algorithm for fused filament fabrication, ICRA 2016 *Best automation paper award

WORKSHOP PRESENTATIONS

1. **Samuel Lensgraf**, Alberto Quattrini Li, Devin Balkcom "Buoyancy enabled autonomous underwater construction with cement blocks", Dartmouth Innovation and Technology Festival *Third best poster
2. **Samuel Lensgraf**, Alberto Quattrini Li, Devin Balkcom "Buoyancy enabled autonomous underwater construction with cement blocks", NERC 2022
3. **Samuel Lensgraf**, Amy Sniffen, Alberto Quattrini Li, Devin Balkcom "Extended abstract: Towards the autonomous underwater construction of cement block structures with free-floating robots", ICRA 2022 Construction Robotics Workshop *Third best paper
4. **Samuel Lensgraf**, Ramgopal Mettu "3D-Aware FDM Printing: An Overview", NERC 2018

MANUSCRIPTS SUBMITTED OR IN PREPARATION

1. **Samuel Lensgraf**, Ankita Sarkar, Adithya Pediredla, Devin Balkcom, Alberto Quattrini Li, "Scalable autonomous underwater assembly using reconfigurable visual fiducials", *(submitted)* ICRA 2024
2. Monika Roznere, Adithya Pediredla, **Samuel Lensgraf**, "Underwater Dome-Port Camera Calibration: Modeling of Refraction and Offset through N-Sphere Camera Model" *(submitted)* ICRA 2024
3. Amy Sniffen, **Samuel Lensgraf**, Zezhou Sun, Alberto Quattrini Li, Emily Whiting, Hsien-Chih Chang, Devin Balkcom "Automated design, analysis, and construction of planar interlocking block structures" *(in preparation)* IJRR