BLAKE R. BUCHANAN

SENIOR ROBOTICS SOFTWARE ENGINEER

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EDUCATION

Carnegie Mellon University Pittsburgh, PA
Master of Science in Robotics *August 2020*
School of Computer Science, Robotics Institute

University of North Carolina at Charlotte Charlotte, NC
Bachelor of Science in Mechanical Engineering *May 2018*
Department of Mechanical Engineering and Engineering Science

EXPERIENCE

Neya Systems Pittsburgh, PA
Senior Robotics Software Engineer *January 2024 - Present*
- Developing product-focused test-driven software for vehicle-agnostic off-road autonomy in unstructured environments.
- Integrate, validate, deploy, and test features on off-road vehicles in the field as part of production.

Sarcos Robotics Pittsburgh, PA
Autonomy and Motion Planning Engineer II *January 2023 - January 2024*
- Led and carried out development of an embedded systems implementation of admittance control with real-time constraints to support contact-sensitive manipulation tasks and human-robot interaction capabilities.
- Developing and integrating motion plans and supporting features for ROS2-based autonomous robot manipulation solutions for aviation, solar field construction, and defense industries.
- Developing real-time software in C++ for embedded linux, high-level autonomy, and control applications for solutions leveraging the Guardian XM and other Sarcos manipulators.
- Led and conducted routine robot hardware testing.

Sarcos Robotics Pittsburgh, PA
Software Engineer I *October 2021 - January 2023*
- Developed and delivered a software stack for a custom robotic solution capable of manipulating heavy ammunition rounds within specified time and space requirements for the U.S. Army Applications Laboratory.
- Developed software to support the manipulation of photovoltaic modules for solar field construction within specified time requirements (see here).
- Led the development of motion plans and high-level autonomous behaviors for a mobile manipulation platform that semi-autonomously extracted casualties from dangerous environments.

The Robotics Institute at Carnegie Mellon University Pittsburgh, PA
Biorobotics Lab, Researcher *May 2018 - August 2021*
- Introduced a novel perspective for finding optimal controls for nonholonomic multi-robot systems in dynamic environments using geometric optimal control techniques.
- Developed software in Python, Julia, and MATLAB to test and validate dynamical systems and control strategies.
- Authored / co-authored two published papers concerning fundamental mechanical models for biologically inspired robotic systems and helped author an awarded NSF research proposal concerning multi-agent robotic systems (see here)

University of North Carolina at Charlotte Charlotte, NC
Faculty Lab, Undergraduate Research Assistant *May 2016 - May 2018*
- Designed experiments and motion control electronics packages for biologically inspired terrestrial and aquatic robots using Arduino microcontrollers.
- Developed an affordable RTK-based differential positioning Raspberry Pi package to track the position of biologically inspired terrestrial and aquatic robots.

TECHNICAL SKILLS

Languages: C++, Python, Julia, MATLAB

PROJECTS

GraphEQA: Using 3D Semantic Scene Graphs for Real-time EQA (Website) **Language**: C++, Python

- Developed and integrated Google's Gemini and Anthropic's Claude Sonnet into GraphEQA framework for use in embodied question answering (EQA).
- Integrated and deployed GraphEQA on Hello Robot's RE2 Stretch Platform in a home environment.

Swimming In Potential Flow (GitHub) **Language**: Julia

- Implemented two-dimensional fluid simulation of a flexible fish robot in point vortex flows using Julia.

PID Control for Planar Aquatic Vehicle in Point Vortex Flows (Website) **Language**: MATLAB

- Implemented PID control for a novel impulsively actuated two-dimensional aquatic vehicle in an inviscid fluid.

PUBLICATIONS

S. Saxena, **B. Buchanan**, C. Paxton, B. Chen, N. Vaskevicius, L. Palmieri, J. Francis and O. Kroemer, (2024) "GraphEQA: Using 3D Semantic Scene Graphs for Real-time Embodied Question Answering" *arXiv.org Preprint*, (PDF)

B. Buchanan, T. Dear, S.D. Kelly, M. Travers, H. Choset, (2021) "The Geometric Structure of Externally Actuated Planar Locomoting Systems in Ambient Media," *arXiv.org Preprint*, (PDF)

B. Buchanan (2020) "Mechanics and Control of Coupled Interactions in Ambient Media," *Master's Thesis*, Carnegie Mellon University, Pittsburgh, PA. (PDF)

B. Buchanan, M. Travers, H. Choset, and S. D. Kelly (2020) "Stability and Control of Chaplygin Beanies Coupled to a Platform through Nonholonomic Constraints," *ASME DSCC 2020* (PDF)

T. Dear, **B. Buchanan**, R. Abrajan-Guerrero, S. D. Kelly, M. Travers, and H. Choset, (2020) "Locomotion of a multi-link nonholonomic snake robot with passive joints," *International Journal of Robotics Research* (PDF)

TALKS

Buchanan, B. (2019, May). *Modeling and Dynamics of Planar Swimmers Coupled through Wake Vorticity*. Presentation given at the 2019 SIAM Conference on Applications of Dynamical Systems (DS19)

Buchanan, B., Travers, M. Choset, H., Kelly S. (2020, October). *Stability and Control of Chaplygin Beanies Coupled to a Platform Through Nonholonomic Constraints*. Presentation given at the ASME 2020 Dynamic Systems and Control Conference (mp4)

ADDITIONAL EXPERIENCE

University of North Carolina at Charlotte January 2016 - May 2018

Department of Mechanical Engineering, Undergraduate Teaching Assistant

- Delivered supplemental lectures for undergraduate dynamics courses, resulting in an overall increase in comfort with course material and performance
- Assisted students in learning the PTC Creo CAD package

The Robotics Institute at Carnegie Mellon University Pittsburgh, PA

Biorobotics Lab, Robotics Intern *May 2017 - August 2017*

- Designed and developed a robot contributing to published research concerning underactuated snake robot control (PDF).