

BLAKE R. BUCHANAN

ROBOTICS SOFTWARE ENGINEER

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EDUCATION

Carnegie Mellon University

Master of Science in Robotics, GPA: 3.76 / 4.00

School of Computer Science, Robotics Institute

Pittsburgh, PA

August 2020

University of North Carolina at Charlotte

Bachelor of Science in Mechanical Engineering, GPA: 3.48 / 4.00

Department of Mechanical Engineering and Engineering Science

Charlotte, NC

May 2018

EXPERIENCE

Sarcos Robotics

Autonomy and Motion Planning Engineer II

Pittsburgh, PA

January 2023 - Present

- 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

Software Engineer I

Pittsburgh, PA

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

Biorobotics Lab, Researcher

Pittsburgh, PA

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)

The Robotics Institute at Carnegie Mellon University

Biorobotics Lab, Robotics Intern

Pittsburgh, PA

May 2017 - August 2017

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

University of North Carolina at Charlotte

Faculty Lab, Undergraduate Research Assistant

Charlotte, NC

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

Platforms / Tools: ROS2, Docker, GitLab, MoveIt2, MoveIt Task Constructor, ros2_control, ros2_controllers, BehaviorTree.CPP

PROJECTS

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 (Project Website)

Language: MATLAB

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

PUBLICATIONS

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 Beanie Coupled to a Platform through Nonholonomic Constraints," *ASME DSCC 2020* (PDF)

T. Dear, **B. Buchanan**, R. Abraján-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 Beanie 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