William Baldwin Smith V

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Education

- **University of Virginia**, *Master of Engineering in Mechanical Engineering: GPA: 3.97* *Charlottesville, VA*, *2021 - 2023*
- **University of Virginia**, *Bachelor of Science in Mechanical Engineering; GPA: 3.67* *Charlottesville, VA*, *2018 - 2021*

Skills Summary

- **Languages/Libraries**: C/C++, Python, MATLAB, Java, R, OpenCV, GStreamer, PyTorch, NumPy, Matplotlib
- **Tools**: ROS, Linux, Git, Docker, Simulink, SOLIDWORKS, Autodesk Inventor, Ansys
- **Hardware**: Arduino, Raspberry Pi, NVIDIA Jetson, ESP32

Experience

- **Applied Research Associates, Inc.**, *Staff Scientist I, ISR, ASIRT* *Raleigh, NC*, *Oct 2023 - Present*
  - Implemented a visual inertial odometry system to predict the 6 DoF displacement of a UAV for GPS-denied localization. Developed GStreamer pipelines to set up an RTSP server with muxed video and MISB 0601 formatted metadata for communication between the drone and base computer.
  - Led integration effort to deploy urban geolocalization algorithms on servers and embedded systems. Optimized and cross-compiled algorithms for an embedded processor to directly interface with onboard sensors. Developed an asynchronous processing pipeline to pass data from sensors to different stages of the algorithm.
  - Improved map creation with parallel computing, to increase generation speed by more than 100x, and efficient compression techniques, to reduce global map size by 75%. Implemented a particle filter for state estimation to constrain the search region, leading to improved accuracy and speed.
  - Researched machine learning-based depth estimation models to obtain passive ranging for every pixel in the image. Implemented a PCA-based correction to restore depth scale through consecutive panned or zoomed images. Trained an ensemble model to estimate camera intrinsics and extrinsics of wild images.
- **University of Virginia**, *Graduate Research Assistant* *Charlottesville, VA*, *Mar 2021 - Mar 2023*
  - Researched novel approaches for robotic systems for various projects based on customer needs. Investigated prior works to determine the current deficiencies in state-of-the-art systems. See projects below.
  - Co-authored multiple publications based on developed research materials. Assisted the principal investigator with proposal writing for grants and other funding.
  - Designed and built unmanned ground vehicles with varying embodiments to carry a robotic manipulator. Implemented path planning and motor control algorithms to allow basic autonomy with various tasks.
- **NASA Langley Research Center**, *Engineering Intern, Autonomy Incubator* *Hampton, VA*, *June 2017 - July 2017*
  - Designed and developed a radio-controlled rover as part of a team of three interns. Constructed to meet target specifications, including: carry at least 50 pounds, weigh under 15 pounds, and be stable in defined environments.

Projects

- **Mobile Manipulation Motion Planning**: Researched a whole-body planner for mobile manipulators using Lie theory and optimization. Presented at the Mobile Manipulation workshop at RSS 2025. (2023-2025)
- **Multi-Stage High Precision Mapping**: Developed a method to improve robotic mapping of buildings with millimeter resolution and high accuracy. Presented at SSRR2022 and published in Robotics 2023. (2021-2023)
- **Additive Manufacturing with Extruded Clay via a Mobile Manipulator**: Created an autonomous system for additive manufacturing using mobile manipulators. Collaborated with other students and researchers in other departments. (2022)
- **Autonomous Campus Vehicles**: Designed an autonomous golf cart with drive-by-wire controls and SLAM with fused depth cameras and LiDAR. Implemented convoying between vehicles with shared location beliefs and visual correction. (2021-2022)

Publications

[1] **Smith, W.**, Singh, S., Rudy, J., Guan, Y., "Whole Body Planning of Mobile Manipulators Leveraging Lie Theory based Optimization," en, in *RSS 2025 Workshop: Mobile Manipulation: Emerging Opportunities & Contemporary Challenges*, Jun. 2025. [Online]. Available: https://openreview.net/forum?id=7ZRclFFHSK&noteId=7ZRclFFHSK.

[2] **Smith, W.**, Qin, Y., Singh, S., Burke, H., Furukawa, T., Dissanayake, G., "A multistage framework for autonomous robotic mapping with targeted metrics," *Robotics*, vol. 12, no. 2, 2023, ISSN: 2218-6581. DOI: 10.3390/robotics12020039. [Online]. Available: https://www.mdpi.com/2218-6581/12/2/39.

[3] **Smith, W.**, Qin, Y., Furukawa, T., Dissanayake, G., "Autonomous Robotic Map Refinement for Targeted Resolution and Local Accuracy," in *2022 IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)*, 2022, pp. 130–137. DOI: 10.1109/SSRR56537.2022.10018686.