Andrew **Torgesen**

Roboticist · Mechanical Engineer · Computer Scientist

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Education

Massachusetts Institute of Technology
Cambridge, MA

M.S. in Aeronautics and Astronautics, Autonomy Emphasis — *September 2019 - Present*

- 5.0/5.0 GPA

Brigham Young University
Provo, UT

B.S. in Mechanical Engineering — *September 2012 - April 2019*

- Graduated with *Magna Cum Laude* honors.
- Computer Science and Mathematics Minors.

Work Experience

Aerospace Controls Lab
Cambridge, MA

Graduate Research Assistant — *September 2019 - Present*

- Designing and implementing planning architectures for collaborative, active SLAM on compute-limited UAV platforms for radiological search.
- Constructed a Unity-based, simulated perception environment for benchmarking collaborative SLAM algorithms using stereo/depth cameras and LiDAR sensing.
- Designed, implemented, and tested a complete unmanned aircraft autonomy system architecture, consisting of interacting control, estimation, and perception algorithms, in C++ for real-world tethered flight operations in a maritime environment.
- Created a high-fidelity, configurable simulation environment in C++ for testing flight control, computer vision, and trajectory planning algorithms while simulating aerodynamic forces and contact dynamics.
- Designed and implemented an error-state Kalman Filter that fuses IMU, barometer, carrier-phase differential GPS, and vision-based pose measurements for both absolute and relative state estimation for an unmanned aircraft.
- Expanded a custom autopilot running on an F4 microprocessor to use a quaternion-based control scheme and to optionally circumvent the need for an RC connection for fully autonomous flight.

Raytheon
Tucson, AZ

Guidance, Navigation, and Control Engineer — *May 2019 - August 2019*

- Implemented and integrated a new gun drive system model into an autonomous track-and-fire defense simulation written in Ada and C.
- Conducted two in-depth trade studies while automating several testing procedures in the process for increased efficiency.
- Used debugging and engineering analysis of simulation results to pinpoint several disparities between the simulation and the physical system.

Magicc Lab
Provo, UT

Research Assistant — *April 2017 - April 2019*

- Designed and implemented a factor graph back-end optimizer that calculates the 6-DOF offsets between a camera sensor and an IMU.
- Created a C++ simulation of an autonomous multirotor for landing on a heaving boat leveraging computer vision.
- Worked with hardware on a multirotor for field testing of a camera offset optimization routine.

Air Force Research Laboratories
Albuquerque, NM

Robotics Developer — *May 2018 - August 2018*

- Designed and implemented a well-documented real-time C++ simulation of a 7-DOF robot arm in ROS to match the behavior of real hardware.
- Researched and implemented an inverse kinematic path planner for the control of a robotic arm.
- Designed and tested an Extended Kalman Filter using fiducial markers and IMU data to localize objects without motion capture.

Project Experience

Autonomous UAV Team
Provo, UT

Brigham Young University — *September 2018 - June 2019*

- Captain of team of 12 undergraduate seniors in Mechanical, Electrical, and Computer Engineering for the international AUVSI-SUAS competition.
- Used agile project management tools to coordinate efforts of controls, computer vision, unmanned ground vehicle, and airframe sub-teams.
- Led flight testing and tuning of lateral and longitudinal autopilot, implementing supporting path following and state estimation algorithms.

Skills & Coursework

Skills
- Modern C++, Python
- ROS, Gazebo
- Matlab
- Git, Linux, Bash
- Technical Communication

Concepts
- Modeling and Simulation
- Bayesian State Estimation
- Perception and SLAM
- Optimization, Factor Graphs
- Autopilot Design

Coursework Sample
- Visual Navigation for Autonomous Vehicles
- Applied Machine Learning
- Optimal Control and Estimation
- Dynamic Optimization and Control
- Principles of Autonomy and Decision Making