Malhar Mahajan

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EDUCATION

Virginia Tech, Blacksburg VA — B.S. Aerospace Engineering — **May 2027**
Guidance, Control & Navigation Concentration — GPA 3.85/4.00
Relevant Coursework: Fluid Dynamics, Operational Methods, Non-Linear Dynamics and Chaos, System Dynamics and Control, Aerospace Structures, Statics and Dynamics, Air Vehicle Dynamics and Space Vehicle Dynamics

SKILLS

Languages: C++, MATLAB, Python, Java
Software/Tools: Visual Studio, CREO, Siemens NX, Teamcenter, Hypermesh, ANSYS, SolidWorks, Matlab Simulink, Ardupilot, OpenFoam, Linux
Frameworks/Libraries: FEA, CFD, MAVSDK, ROS, PyChrono, Tensorflow, Computer Vision, JMavSim, GIT version control, SITL, HITL, Excel

EXPERIENCE

Simulations Intern, Caterpillar Inc. — **May 2025 - August 2025**
- Conducted detailed structural FEA simulations on cooling equipment components with the goal of comparing Siemens NX NASTRAN solver to Hypermesh ABAQUS solver to determine optimal linear/non-linear stress concentrations, fatigue, and plastic deformation under lifting and operational loads.
- Performed finite model, thermal, and CFD Analysis on various cooling products in the Global Thermal Management Systems (GTMS) under Large Power Systems Division (LPSD).
- Potential saving of 45 percent by initiating switch over to NASTRAN solver in LPSD.
- Participated in structural reviews and cross-functional meetings, contributing technical insight and helping ensure manufacturability and serviceability.
- Gained hands-on experience with automized workflows, data management through Teamcenter.

Advanced Controls Systems Laboratory Dr. L'Afflitto — **August 2024 - Present**
- Developed a three-DOF thrust stand testbed using small UAVs for Naval Air Warfare Center Aircraft Division (NAWCAD) to support autonomous controller tuning through a Genetic-Algorithm (GA) powered by MATLAB.
- Led the integration of hardware and software working with Pixhawk 6C and an Odroid M1S running ROS2-Galactic.
- Implemented a ROS2-based moment cancellation system in C++, utilizing Dynamixel motors, and moment-inertia equations.
- Created a high-pass filter to get accurate acceleration data from IMU published position and velocity.

Team Lead, Avionics and Programming, GoAERO @VTech — **August 2024 - Present**
- Won NASA University Innovation prize worth 30k.
- Leading the Avionics and Programming section, focusing on the integration of flight control systems and avionics for UAVs.
- Oversaw the design and development of ROS2 based drone communication architecture.
- Integrated in house developed control system by Advanced Control systems laboratory in vehicle control loop.
- Coordinating with multidisciplinary teams to ensure the seamless integration of avionics systems with overall vehicle architecture.

PROJECTS & CLUB EXPERIENCE

Autonomous UAV — **May 2024 - August 2024**
- Engineered an autonomous drone using a Jetson Nano and Intel RealSense D455, working on real-time 3D environmental mapping using SLAM Algorithm and obstacle detection/person following using OpenCV.
- Integrated MAVSDK for advanced flight control with a Python script and utilized JMavSim and SITL/HITL for rigorous simulation and testing. Working on PID, Logistic, and Adaptive velocity control for the drone.
- Implemented simple gesture recognition to use for takeoff, landing, selfies, and other commands.
- Modeled the drone in SolidWorks, conducting simple CFD airflow/thermal analysis to predict performance in the air and prevent oscillations. Demonstrated potential improvements in drone stability and navigational precision.