Aaron Omadutt

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Education

Swarthmore College - Swarthmore, Pennsylvania | May 2024
BS in Engineering & BA in Mathematics | GPA: 3.30

Relevant Coursework: Thermofluid Mechanics, Aerodynamics, Computer-Aided Manufacturing and Procedural Design, Dynamics of Mechanical Systems, Mechanics, Linear Physical Systems Analysis, Experimentation for Engineering Design, Modeling, Stochastic and Numerical Methods

Experience

Undergraduate R&D Engineer – Swarthmore College | June 2023 – Janurary 2024

- Developed a robotic model mimicking barnacle larvae swimming techniques, supporting research on larvae body extensions and limb motion through extensive literature review and prototype testing.
- Enhanced Nitinol springs for use as lightweight motor substitutes by optimizing variables such as spring length, current intensity, and cooling times, resulting in reliable actuation.
- Replicated nauplii swimming patterns by integrating Nitinol springs with microcontrollers and 3D-printed elements, and precisely programmed microcontroller for controlled spring movements.
- Achieved a compact robotic design by miniaturizing subsystems through module redesign and creating a custom PCB board to house all electronic components seamlessly.
- Presented research at the Society for Integrative and Comparative Biology (SICB) Conference, recognized as a Best Student Presentation Finalist for contributions to robotics and biological modeling.

Projects

4-Wheel Independent Steering Drivetrain | github.com/Swarthmore-Robotics/Swerve-Drive

- Led a team of three in designing, assembling, and programming an omni-directional robot equipped with a web camera for intelligent sorting and transfer of colored boxes, simulating industrial workplace scenarios.
- Implemented swerve drive kinematics in software and integrated computer vision software for object/color detection, enhancing robot functionality in warehouse and manufacturing environments.
- Successfully showcased the robot's capabilities through two demos: a tele-operational demonstration highlighting swerve drivetrain maneuverability and an autonomous demo showcasing object detection and precise navigation to designated locations.

Wind Tunnel Testing and Airfoil Analysis

- Designed and fabricated a NACA 1412 airfoil model using Fusion 360 and 3D printing technologies.
- Mounted the airfoil in a wind tunnel to experimentally gather pressure distribution patterns and wake characteristics. Utilized MATLAB for precise data collection and aerodynamic force quantification.
- Implemented experimentally determined airfoil parameters into simulation software to simulate and optimize flight performance.

High Power Model Rocket

- Utilized OpenRocket software to model and simulate a rocket, predicting optimal apogee and parachute deployment dynamics based on theoretical parameters including rocket mass, nose cone aerodynamics, dimensions, and environmental conditions.
- Conducted analysis of nose cone performance characteristics for subsonic flight, integrating findings into the design process. Modeled and fabricated the chosen nose cone using Fusion 360 and 3D printing techniques.
- Constructed the rocket utilizing an H-class motor, an integrated electronics bay for precise parachute deployment, and calibrated masses for enhanced flight stability and performance.

Skills

Technologies/Frameworks: Fusion360, SOLIDWORKS, OpenRocket, Minitab, Stata
Programming Languages: MATLAB, Python, Java, C/C++
Prototyping and Fabrication: 3D Printing, CNC Machining, PCB Schematic Design