AASHISH SINGH ALAG

Worcester, MA, 01609 | aalag@wpi.edu | (774) 415-3970 | LinkedIn

PROJECTS

Open-Sourced Hexapod Simulator, Legged Robotics, WPI **Jan 2024 – Mar 2024**

- Developed a comprehensive hexapod robot simulator focusing on stationary robots, using advanced kinematic analysis to simulate Forward Kinematics (FK) and Inverse Kinematics (IK), enabling accurate visualization of joint angles and end-effector positions.
- Designed and modeled the hexapod's geometric and leg kinematics, using mathematical frameworks and transformation matrices for precise simulation of leg movements, providing a modular and scalable tool for legged robotics applications.
- Implemented an interactive GUI using Matplotlib and Dash, allowing real-time control over robot parameters such as joint angles, gait patterns, and leg movements, enhancing user engagement and providing immediate visual feedback for debugging and performance optimization.

3D Printed Humanoid Robot, Major Qualifying Project, WPI **Aug 2022– May 2023**

- Designed and enhanced an open-source 3D-printed humanoid robot, focusing on structural improvements by upgrading the internal frame and joints, resulting in a 20% increase in overall stability and durability during motion.
- Engineered and integrated functional grippers and balance sensors, enabling the robot to perform complex tasks such as object manipulation and dynamic stabilization, improving task accuracy.
- Optimized 3D print quality through material selection and print parameter adjustments, enhancing component strength and reducing post-processing time by 30%, leading to more cost effective and efficient robot assembly.

Quadrotor Controller for UAV Capture, Robot Control, WPI **Dec 2023 – Mar 2024**

- Developed a robust LQR-based control system for a quadrotor tasked with intercepting and capturing intruding Unmanned aerial vehicle (UAV) within a restricted airspace, achieving optimal control by minimizing state deviations and control effort, and demonstrating captures across various flight paths and disturbances.
- Designed and implemented a real-time controller using MATLAB, incorporating dynamic adjustments of control priorities (position, velocity, and orientation) based on proximity to the target UAV, ensuring precise interception and safe return to the nest, even under varying environmental conditions and external disturbances.
- Simulated and tested the controller against challenging UAV trajectories, including circular paths and high-velocity movements, identifying key performance limitations and proposing improvements, such as predictive modeling for more efficient interception on complex trajectories.

Force Amplification System, Advanced Engineering Design, WPI **Oct 2023 – Mar 2024**

- Designed a force amplification system for enhanced electronic actuation in safety applications using SolidWorks and Creo, improving response time and reliability under varying load conditions.
- Developed and implemented testing procedures, including a custom rig for accurate measurement and verification of the amplification factor, ensuring compliance with safety standards.
- Collaborated with cross-functional teams to integrate the system into existing safety mechanisms, contributing to a 20% increase in the efficiency of actuation systems.

Autonomous RC Car, Engineering Design, WPI **Mar 2021 – May 2021**

- Designed and developed an electro-mechanical system for an autonomous RC car capable of navigating complex obstacle courses while dynamically adjusting to variable load conditions, enhancing adaptability and performance.
- Performed structural analysis on Ansys and derived equations of motion to simulate and optimize load-bearing capacity leading to a 25% improvement in car stability during high-speed maneuvers by identifying stress points and reinforcing critical components.
- Evaluated and tested multiple materials for the car's components, ensuring the functionality, practicality, and cost-effectiveness of each part, ultimately reducing material costs by 15% while maintaining performance efficiency.

TECHNICAL SKILLS

Software & Practices: SolidWorks, Arduino, AutoCAD, Rhino, Creo, Tinker CAD, Fusion 360, Maya, Espirit, Maple, LoggerPro, Adobe Creative Suite, Raspberry Pi, Autodesk Suite, Multisim
Programming: Python, MATLAB, HTML, Vivado Design Suite
Manufacturing: FDM 3D-printing, Resin 3D-printing, CNC Milling & Lathing, Laser-cutting

EDUCATION

Worcester Polytechnic Institute (WPI), Worcester, MA
Bachelor of Science, Mechanical Engineering, GPA 3.85/4.0
Master of Science, Mechanical Engineering, GPA 3.83/4.0

ADDITIONAL EXPERIENCE

Teaching Assistant, Mechanical & Materials Engineering Department, WPI **Aug 2023 – Mar 2024**
Peer Learning Assistant, Mathematics Department, WPI **Aug 2020 – May 2024**
Office Assistant, International House, WPI **May 2022 – May 2024**
Advanced Rapid Prototyping Lab Assistant, ARC, WPI **Aug 2021 – May 2023**

LEADERSHIP AND ENVOLVENMENT

President, Graduate Student Government, WPI **Aug 2023 – Mar 2024**
Member, Tau Bata Pi, Massachusetts Alpha Chapter **Jan 2022 – Mar 2024**
President, International Student Council, WPI **Jan 2021 – May 2023**