Sourish Tetakayala

+1-520-360-2135 linkedin sourish@arizona.edu Portfolio

Work Experience

Robotics Research Engineer, *University of Arizona, AZ* Jan 2023 – Jun 2024

Quadruped Navigation and Control

- Designed a fluid flow-based motion model for quadruped robots, improving trajectory accuracy and reducing deviations by 30%.
- Integrated ROS2 middleware with Vicon Motion Capture for real-time localization, reducing positional error by 25%.
- Conducted 170+ trials to optimize trajectory planning and response latency, achieving a 20% reduction in motion lag.
- Applied finite element analysis (FEA) to assess structural integrity across terrains, optimizing load distribution and minimizing deformation.
- Developed model predictive control (MPC)-based strategies for quadruped motion, improving stability during dynamic maneuvers.
- Documented system architecture, sensor calibration, and deployment procedures to standardize robotic operation.
- Led risk analysis for robotic deployment, ensuring mechanical compatibility and reducing system failures.
- Investigated multi-robot coordination for agricultural applications, integrating UAVs and quadrupeds for crop monitoring.

Quadcopter Team Coordination

- Developed a 2D affine transformation model for UAV-quadruped coordination, enhancing formation control and reducing collision risk.
- Designed Jacobian-based real-time motion planning, improving quadcopter path accuracy by 20% in constrained environments.
- Implemented sensor fusion techniques with LIDAR, IMU, and Vicon localization, reducing tracking errors in UAV navigation.
- Conducted hardware-in-the-loop (HIL) simulations to refine UAV state estimation, improving real-time feedback for trajectory corrections.
- Improved mission efficiency by 30% through PLC-driven automation and adaptive multi-agent decision-making.
- Performed risk assessments to ensure compliance with safety standards, mitigating operational vulnerabilities in autonomous systems.

Student Researcher, *University of Arizona, AZ* Jul 2023 – Dec 2024

Bicopter System Control & Stability

- Designed and implemented PID and LQR controllers, achieving a steady-state error of 0.0094 radians and reducing average overshoot to 17.45%.
- Conducted system identification using ARX and State-Space models, achieving model fits of 64.41% and 58.15%, respectively.
- Reduced settling time to 17.99 seconds during experimental validation, improving dynamic response under varying motor speeds.
- Integrated Simulink and Arduino for real-time data acquisition and closed-loop control, enhancing control accuracy by filtering transient noise.

Projects

Generative Design & Additive Manufacturing Project

- Designed and manufactured lightweight structural components using generative design, optimizing weight efficiency and durability.
- Improved stress resilience of GE bracket designs, achieving a maximum von Mises stress tolerance of 441 MPa for high-load performance.
- Simulated 3D printing processes and tested multiple materials, identifying the most effective composition for enhanced structural efficiency.
- Performed FEA-based optimization and CFD simulations to refine load distribution, minimizing deformation under operational stress.
- Analyzed material properties of Titanium, Cobalt Chrome, and Aluminum to balance strength and weight for industrial applications.
- Conducted cost analysis using a Process-Based Cost Model, identifying post-processing as contributing up to 47% of total manufacturing costs.

Centrifugal Pump Performance Optimization

- Conducted CFD simulations and modal analysis to optimize impeller material selection, improving durability under stress loads.
- Analyzed impellers using GFRP composites, reducing mass by 73% compared to conventional grey cast iron (0.1935 kg vs. 0.7146 kg).
- Improved system stiffness by 72%, with GFRP achieving higher natural frequencies (5834 Hz vs. 3390 Hz), minimizing resonance risks.
- Proposed design modifications to reduce cavitation and vibration-induced failures, enhancing pump efficiency for industrial applications.

Research Publications

- **M. Ghufran, S. Tetakayala, H. Rastgoftar**, "Motion Planning for Quadruped Teams: An Experimental Evaluation Using a Dynamic Fluid Flow Model," IEEE, DOI: 10.1109/ICARCV63323.2024.10821616.
- **M. Ghufran, S. Tetakayala, J. Hughes, A. Wilson, H. Rastgoftar**, "Quadcopter Team Configurable Motion Guided by a Quadruped," IEEE, DOI: 10.1109/ICARCV63323.2024.10821600.

Technical Skills

Languages:	Python, C++, MATLAB, Arduino, Simulink
Tools:	ROS2, Gazebo, SolidWorks, FEA, CFD, SAP
Technologies:	Vicon, LIDAR, IMU, MPC, PID, LQR

Education

M.E. Robotics and Automation

University of Arizona, AZ Jan 2023 – Dec 2024

Relevant Coursework: Control Systems, System Identification, Embedded Systems, CAD Design, Machine Learning, Computational Robotics, Autonomous Systems, Sensor Fusion, Deep Learning, Digital Twin Technologies

B.Tech Mechanical Engineering

Hindustan Institute of Technology and Science, India Jun 2018 – Apr 2022

Relevant Coursework: Finite Element Analysis, Computational Fluid Dynamics, Manufacturing Systems, Structural Analysis, Control Theory