Aron Wilson Mathias

Arizona, AZ | www.linkedin.com/in/am8466|+1 (520)-203-5971 |aronwilsonm@gmail.com |Portfolio

EDUCATION

University Of Arizona, Arizona, USA *August 2023- May 2025*
ME in Robotics and Automation. *Graduation Date: May 2025*
Relevant Coursework: Design of Mechatronics System, Introduction to Advanced Control Theory, Robot Operating System, Non-linear and Optimal Control, Introductory Robotics: Kinematics, Dynamics and Path Planning ,Introduction to Machine learning, Principles of Artificial Intelligence,Semi-conductor Processing

SRM Institute of Science and Technology, Kattankulathur , India *August 2018- May 2022*
B-Tech in Mechatronics Engineering

SKILLS

Programming: Python, C++, C, HTML, MATLAB, Simulink, ROS, Machine Learning & AI, PLC Programming (Siemens), Robotics Programming, Control Systems & Automation.

Software: SOLIDWORKS, Fusion 360, AutoCAD, ANSYS, Adobe Creative Cloud, Simatic Manager, Docker Container, Linux(Ubuntu),SCADA, HMI,MS Office

Tools: Raspberry Pi, Arduino, CAD Modeling, Data Analysis, 3D Printing, Casting, Soldering, FANUC, PLC Automation

SOFT SKILLS: Problem-Solving and Critical Thinking, Teamwork and Collaboration, Creativity and Innovation, Adaptability and Flexibility, Effective Communication, Interpersonal Skills, Leadership and Mentorship, Time Management and Prioritization, Continuous Learning and Knowledge Upgradation, Project Management, Attention to Detail.

WORK EXPERIENCE

***Graduate Research Assistant* , University of Arizona, Tucson, USA** *January 2023 – Present*
- Led DGUV development using Affine transformations in ROS2, improving mobility by 40%, response time by 30%, and testing efficiency by 50% via Gazebo simulations. Integrated IoT sensors for real-time monitoring.
- Developed a multi-robot system with Affine transformations, Vicon motion capture, and Gazebo, ensuring collision-free navigation, reducing testing by 50%, and improving stability by 35%.
- Designed three deformable UAVs with real-time control, enhancing stability and adaptability. Integrated IoT telemetry, achieving 98% reliability and 30% better flight stability.
- Applied deep learning, PID controllers, and sensor fusion for SLAM, LiDAR mapping, and obstacle avoidance, improving localization accuracy by 60%.
- Optimized deep learning models for real-time inference on embedded hardware, improving object detection, navigation, and mapping, reducing failure rates by 40%.

***Technical Assistant,* Fareast Marine Services India Private Limited, Mumbai, India** *November 2019 - December 2020*
- Diagnosed and resolved 30+ critical technical issues in robotic and automated systems, enhancing operational reliability and minimizing downtime..
- Integrated FANUC robots with Siemens and Allen-Bradley PLCs, improving process efficiency and reducing operational delays by 35% through streamlined system monitoring.
- Developed and configured HMI interfaces for real-time control, fault diagnostics, and seamless operator interaction with automated machinery.
- Conducted preventive maintenance, calibration, and troubleshooting of robotic arms, CNC machines, and industrial control systems, ensuring long-term functionality and accuracy.

RESEARCH PROJECTS/ACADEMIC PROJECTS

Quanser QCar 2 and Qdrone2 – Autonomous Vehicle Simulation & Control
- Implemented advanced motion planning and control algorithms for real-time autonomous navigation and obstacle avoidance**,** achieving high-precision localization**.**
- Utilized deep learning models for object detection, SLAM, and sensor fusion, ensuring robust environmental awareness and autonomous path planning**.**
- Optimized deep learning architectures for real-time inference on embedded hardware, enhancing control efficiency**,** trajectory accuracy, and adaptive decision-making.

Continuum Deformation Unmanned Vehicles (University of Arizona -TLA) (Paper Submitted to IROS 2025)
- Built a Deformable Ground Unmanned Vehicle (DGUV) with modular circular frames, improving mobility and adaptability by 40% in dynamic environments while enhancing motion planning and navigation capabilities.
- Implemented Affine transformations with ROS2 and Python, enabling precise motion control, real-time localization, and robust collision avoidance, reducing response time to system commands by 30%.
- Simulated and validated system performance in Gazebo, leading to 50% fewer physical testing iterations, refining control strategies, localization accuracy, and obstacle avoidance before deployment.
- Optimized structural design with carbon-fiber and 3D-printed components, reducing weight by 25% while improving durability, enhancing stability by 35% for real-world autonomous operations.

Quadcopter Team Configurable Motion Guided by a Quadruped (University of Arizona) Paper Accepted for Publication at ICARRCV
- Developed and experimentally validated a heterogeneous aerial-ground robotic system using Affine transformations with ROS2 and Python, enabling safe and collision-free quadcopter team coordination guided by a quadruped robot.
- Implemented a configurable motion model where the quadruped dictates global translation**,** whil**e** quadcopters execute controlled deformation via a nonsingular Jacobian matrix**,** ensuring adaptive navigation, precise control, and real-time localization in constrained environments**.**
- Conducted hardware-based and mixed virtual-hardware experiments**,** utilizing Vicon motion capture and Gazebo simulation**,** reducing testing iterations by 50% and achieving precise multi-robot coordination with robust collision avoidance**.**
- Optimized system performance by integrating PX4-based quadcopters, ROS1-ROS2 communication bridges, and real-time control algorithms, improving response time by 30%, enhancing formation stability by 35%, and ensuring obstacle avoidance in complex environments.

Deformable Continuum UAV (DCU) (University of Arizona-TLA) Patent for Unique Design and Structure Under Professor
- Designed and optimized three UAVs with a deformable continuum structure, enhancing maneuverability, stability, and adaptability in dynamic environments.
- Developed robust control systems for real-time structural deformation, achieving a 98% reliability rate across varied environmental conditions during testing.
- Implemented advanced control algorithms for precision maneuvering and stability, ensuring consistent and stable UAV performance in real-world deployment.

Autonomous Rover Navigation System Using Modular ROS Nodes
- Devised automated testing procedures within Gazebo simulation environments**,** validating new guidance algorithms every 2 hours**,** resulting in over 80 iterations per month and a 50% reduction in development time before deployment.
- Implemented real-time obstacle avoidance and precise rover navigation algorithms, leveraging Gazebo for dynamic testing and performance optimization, improving navigation accuracy by 40%**.**
- Integrated point cloud processing for enhanced environmental mapping, reducing collision risks by 60% and enabling precise localization in complex terrains**.**

Fabrication of Animatronics Hand
- Built a responsive Animatronic hand with Arduino, achieving real-time manipulation with <2mm deviation for high-precision tasks.
- Implemented **cost**-effective hardware strategies, ensuring accurate human hand mimicry with a focus on safety and durability.
- Optimized motion control, improving responsiveness and adaptability for robotic prosthetics and assistive tech applications.

Smart integrated Mobility Solution Transportation
- Built an AI-powered transportation platform leveraging Python, Google Maps API, and NetworkX**,** achieving a 20% reduction in travel time and enhancing real-time route performance analysis**.**
- Implemented AI-driven optimization algorithms**,** improving passenger flow management by reducing wait times by 15 minutes per hour and increasing overall system efficiency**.**

PUBLICATION

- M. Ghufran, S. Tetakayala, A. Mathias, J. Hughes and H. Rastgoftar, "Quadcopter Team Configurable Motion Guided by a Quadruped," 2024 18th International Conference on Control, Automation, Robotics and Vision (ICARCV), 2024, Accepted for Publication.