

Ashwath Karthikeyan

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EDUCATION

University of Illinois at Urbana - Champaign

Master's of Engineering in Robotics

Champaign, IL

Graduation Date: Dec 2024

EXPERIENCE

United Parcel Service

Warehouse Robot Data Analyst Co-Op

Alpharetta, GA

Jun 2024 - Present

- Created a data visualization tool to monitor about 200 active warehouse robots simultaneously, yielding insights on various inbound and outbound tasks while reducing incident response time by identifying bottlenecks in processes.
- Improved visibility into robot operations in human-inaccessible areas by analyzing real-time data from the Warehouse Management System, identifying inefficiencies, and enabling a 30% reduction in response times to potential issues and delays.
- Devised an anomaly detection system to identify orders falling below a specified performance threshold, analyze patterns contributing to delays, and predict the source of issues with 80% accuracy, enhancing overall operational insights.

Stellantis (Previously Fiat Chrysler Automobiles)

Systems Engineering Intern

Chennai, India

Jun 2022 - Aug 2022

- Constructed comprehensive system models using IBM Rational Rhapsody, transforming 40+ complex vehicle Functional Requirement Diagrams into structured designs, reducing simulation preparation time by 20 hours per project.
- Built and executed 50+ robust test scenarios to validate system model accuracy, ensuring alignment with 10 critical functional and operational requirements while identifying improvements to enhance reliability and performance.
- Secured executive approval to deploy thoroughly validated models, enabling seamless integration into 5 downstream processes and saving approximately 200 hours of fabrication rework annually through enhanced efficiency and precision.

PROJECTS

Multirobot Warehouse Automation

ashwath.net/multirobot/

Alpharetta, GA

Dec 2024 - Jan 2025

- Simulated multi-robot path planning scenarios in PyGame, achieving optimized simultaneous robot movements across complex warehouse grids, reducing average collision rates by 35% through an innovative deadlock-prevention exchange maneuver.
- Automated algorithmic performance evaluations by comparing Dijkstra, A*, and D*-Lite, benchmarking efficiency and execution time. Achieved a 20% improvement in path optimization across dynamically evolving warehouse layouts.
- Orchestrated simultaneous task completion for up to 10 robots in simulated environments, achieving 99% obstacle-avoidance accuracy and reducing task resolution times by 20% compared to baseline methods, ensuring efficient multi-robot coordination.

Automatic Parking in Self-Driving Car

ashwath.net/self-parking/

Champaign, IL

Jan 2024 - May 2024

- Developed a full autonomy stack on ROS for a self-parking functionality on an autonomous vehicle, enabling real-time detection of empty parking spots and precise navigation into them with a 70% success rate in various parking scenarios.
- Programmed a Hybrid A* algorithm for efficient real-time route planning with optimized weights. Designed and tuned an MPC controller for steering and velocity control, ensuring precise trajectory tracking at speeds up to 20 mph.
- Modeled a vision-based deep learning system to identify empty parking spots with 92% mAP. Filtered resulting output to generate a middle-line destination, enabling goal pose estimation for the planning module with an accuracy of 35 cm.

Development of a Rotary Inverted Pendulum

ashwath.net/rip/

Champaign, IL

Dec 2023 - Jan 2024

- Implemented a comprehensive simulation of a Rotary Inverted Pendulum (RIP) system in MATLAB-Simulink, achieving stable equilibrium control across 360° of pendulum rotation and demonstrating real-time response rates under 50ms.
- Devised dual control strategies: a basic PID controller effective within 15° of equilibrium, and an advanced state-space controller that expanded the stable operating range to 45°, resulting in a 3x improvement in disturbance rejection capability.
- Engineered a complete mathematical model with 4-dimensional state space, reducing system complexity from nonlinear second-order differential equations to a linear control problem, enabling 95% faster controller tuning and implementation.

SKILLS

Proficiencies: Robot Operating System (ROS), Python, C++, MATLAB, OpenCV, SolidWorks

Domains: Warehouse Management Systems (WMS), Warehouse Robotics, Autonomous Vehicles