Amith Ramdas Achari

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EDUCATION

University of Illinois at Urbana-Champaign | *Master's Mechanical Engineering | CGPA: 3.81/4.00* *Dec 2022*
RV College of Engineering - India | *Bachelor's Mechanical Engineering | CGPA: 8.90/10.0* *July 2020*

Relevant coursework:

• Principles of Safe Autonomy • Robot Dynamics and Control • Artificial Intelligence • Numerical Methods
• Advanced Robust Control • Introduction to Robotics • Applied Control System Design • Vehicle Dynamics

SKILLS

Languages/Tools: C++, Python, MATLAB, Bash, Linux, Git, Microsoft Azure
Software/Libraries: ROS, Gazebo, Carla, RViz, MoveIt, Numpy, Scipy, Pytorch
Modelling and Controls: Simulink, Dynasty, CANape, Solidworks, CATIAV5

WORK EXPERIENCE

Caterpillar – Autonomy Simulation Team *Champaign, Illinois*
Machine Simulation Engineer *Jan 2023- Present*

▪ Developed configurable real-time(RT) models in Dynasty (physics-based numerical solver) & Simulink for controls validation in SIL/HIL environment increasing the velocity by 50%
▪ Integrated & resolved multiple issues on L4 to L8 HIL benches enabling validation of multiple ECMs + Autonomy ECM
▪ Collaborated with cross-functional teams to seamlessly integrate system improvements, enhancing simulation efficiency and performance while ensuring compatibility with overall system requirements
▪ Integrated multiple virtual controls dll in higher fidelity L6 machine real-time plant model for software development and validation in SIL platform - successfully conducted calibrations using CAT-ET and communicated on Virtual CAN
▪ Refactored a complex Fortran codebase to C++ using CMake for efficient build processes. Enhanced code readability and maintainability through modern C++ practices, improving developer productivity by 15%
▪ Automated build and deployment pipeline in Azure DevOps, enabling continuous integration and delivery for faster releases

Machine Simulation Engineer (Co-op) *May 2022-Dec 2022*

▪ FMU generation and validation for QCT777 control module to ensure similar output as Cosimulation (Simulink – Dynasty)
▪ Developed L5 & L6 real-time machine models from high-fidelity VPD models to generate *functional mockup units (FMUs)*
▪ Validation of FMI-compliant models for plant & controls combined in Python and C++, using FMPy and CPPFMU interface

Team Helios Racing *(Powertrain Engineer)* *Bengaluru, India*

▪ Testing and validation lead at the official BAJA Club of our college comprising 50 students. **Led** the team to become the **National Champions** at Enduro Student India, among 60 teams from all over the nation

Continuously Variable Transmission (CVT) for an All-Terrain Vehicle *June 2017-Dec 2019*

▪ Implemented the 'Force Multiplication' mechanism in the primary clutch to reduce the rotational inertia of the system, with adjustable performance determining parameters to make it highly tunable
▪ Devised a custom test rig to simulate the vehicle dynamics and tune the CVT. The simulation results were validated against experimental data based on the readings provided by the sensors on the primary and secondary pulley

PROJECT HIGHLIGHTS

Path Planning for Autonomous Navigation [GitHub] | *Feb 2022-May 2022*

▪ Designed and implemented *planning module* (Dubin's RRT* and Hybrid A*) and deployed on GEM vehicle for autonomous navigation using model predictive controller while considering non-holonomic constraints
▪ Leveraged a priori maps to investigate performance of each algorithm and studied the effects of different hyperparameters

Autonomous Pipeline [GitHub] | *Jan 2022-May 2022*

▪ Integrated autonomous agent pipeline containing perception, decision making and low-level PD control modules (track steering angle and velocity) for an agent to perform lane tracking on a racetrack to avoid obstacles (other stationary vehicles)
▪ Formulated decision module to return reference velocity, modified lateral error, and lane heading error, based on the current state (GPS), obstacle distance (LiDAR), and lateral error & lane heading error - computed in lane detection module (Camera)

Filtering and Localization - Monte Carlo Localization (MCL) [GitHub] | *Feb 2022-April 2022*

▪ Implemented passive MCL localization to estimate the position of a moving vehicle using LiDAR measurements
▪ Studied parameters namely sensor models (4&8 directions), number of particles and sensor limits to detect obstacles in range

Impedance & Position control on a Catalyst 5 robot arm [GitHub] | *Jan 2022-May 2022*

▪ Devised task space PD control with friction compensation to avoid obstacles and follow the optimized trajectory
▪ Impedance control was used to make the robot's end-effector compliant enough to follow the trajectory inside a zigzag groove and a peg hole, and force of at least 50N was applied to push an egg vertically without breaking it