Amith Ramdas Achari

Urbana-Champaign, IL | amithr3@illinois.edu | +1 (217) 305 0768 | amithachari29 | amithachari

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:

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

SKILLS

Programming Languages: C++, Python, MATLAB, Bash
Software/Libraries: ROS, Gazebo, Carla, RViz, MoveIt, Numpy, Scipy, OpenCV, Pytorch, Git
Modelling and Controls: Simulink, Dynasty, KISSsoft, Solidworks, Ansys, CATIAV5

WORK EXPERIENCE

Caterpillar – Autonomy Simulation Team *Champaign, Illinois*
Machine Simulation Engineer (Co-op) *May 2022-Present*
▪ FMU generation and validation for QCT777 control module to ensure similar output as Cosimulation (Simulink – Dynasty).
▪ Developing L5 & L6 real-time machine models from high-fidelity VPD models to generate *functional mockup units (FMUs)*. Using fmi_adapter to wrap FMUs for co-simulation of physical models into ROS nodes.
▪ Validation of FMI compliant models for plant & controls combined in python and CPP, using FMPy and CPPFMU interface.

Xfinito Biodesigns Pvt Ltd *Bengaluru, India*
Product Development Engineer Intern *June 2020-Feb 2021*
▪ Designed and analyzed wearable device in a cross-functional environment, considering mechanical and ergonomic aspects to determine the optimal placement of electronic components to prevent neurodegenerative disorder.
▪ Presented innovative solutions in several pitch competitions, received 2nd runner-up in Medtechnovation.

Team Helios Racing *(Powertrain Engineer)* *Bengaluru, India*
▪ Testing & Validation lead at the official BAJA Club of our college comprising of 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 '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 testing results were compared with the simulation results based on the readings provided by the sensors on primary and secondary pulley.

PROJECT HIGHLIGHTS

Path Planning for Autonomous Navigation *Feb 2022-May 2022*
▪ Designed and implemented *planning module* (Dubin's RRT* and Hybrid A*) and deployed on GEM vehicle for autonomous navigation using off-the-stack model predictive controller while considering non-holonomic constraints.
▪ Leveraged a priori maps to investigate performance of each algorithm and studied effects of different hyperparameters.

Autonomous Pipeline *Jan 2022-May 2022*
▪ Integrated autonomous agent pipeline containing perception, decision making and low-level PD control modules (track steering angle and velocity) for the agent to perform lane tracking on a racetrack while avoiding obstacles (other stationary vehicles).
▪ Formulated decision module to return reference velocity, modified lateral error, and lane heading error, based on current state (GPS), obstacle distance (LiDAR), and lateral error & lane heading error - computed in the lane detection module (Camera).

Impedance & Position control on a Catalyst 5 robot arm *Jan 2022-May 2022*
▪ Devised task space PD control with friction compensation to avoid obstacles and follow 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.

Pick & Place Robot: Warehouse automation *Aug 2021 – Dec 2021*
▪ Implemented kinematically feasible trajectories on UR5 to grab items from a conveyor using multiple suction grippers to sort the objects based on size, and color in Gazebo environment while optimizing the trajectory and considering the constraints.
▪ Dynamic motion planning was done using MoveIt, in response to the motion planning request provided by the vision node.

Capstone Project: Neurorehabilitation of wrist using assistive robot *Jan 2020-May 2020*
▪ Developed a manipulandum to assess and provide therapy for stroke and post-fracture (wrist) patients using a PID controller.
▪ Incorporated an auto-adaptive algorithm to provide appropriate therapeutic exercises based on the patient's competency (grip strength & coordination), automatically changing the exercise level based on the performance of the patient.

CERTIFICATIONS

- Modern Robotics Specialization, Coursera
- Deep Learning Specialization, Coursera
- Machine Learning, Stanford University, Coursera
- Ready Engineer TATA technologies