Pavan Kushal Velagaleti

Robotics Software Engineer — Real-Time Control, Motion, and Robot Communication
C++ / Python / ROS2 — Safety-Critical & Hardware-Integrated Systems
917-708-3110 | pkv236@nyu.edu | Portfolio | LinkedIn | GitHub

Education

New York University — Brooklyn, NY
M.S. Mechatronics and Robotics — *May 2027*

Mahindra University — Hyderabad, India
B.Tech. Mechanical Engineering — *2019 – 2023*

Experience

Articulus Surgical — Bangalore, India
Robotics Software Engineer — System Architecture — *Jul 2023 – Apr 2025*

- Owned real-time control software for multi-arm laparoscopic robotic systems under clinical safety constraints, achieving **20–25 ms end-to-end latency** from sensing to actuation.
- Architected a deterministic multithreaded **C++ control stack** with control loops executing at **1–3 ms cycle times** under concurrent sensing, control, and communication workloads.
- Designed low-latency **CAN-based communication pipelines** for synchronized multi-DOF manipulator control with time-aligned command dispatch and feedback aggregation.
- Implemented forward and inverse kinematics with real-time trajectory generation, ensuring numerically stable matrix operations within tight control-loop deadlines.
- Developed embedded control modules on **ESP32 (ESP-IDF, FreeRTOS)**, integrating watchdogs, fault handling, and safety interlocks validated via hardware-in-the-loop testing.

Projects

UR10e Manipulation and Mid-Air Intercept Simulation
MuJoCo, Python, Dynamics, Control

- Built a physics-based MuJoCo simulation for high-speed manipulation tasks using torque-level control with Jacobian-based PD control.
- Evaluated stability and tracking performance under dynamic targets, actuator limits, and timing constraints; published demos on portfolio.

Vision-Based Human-in-the-Loop Robotic Finger Control
Python, C++, MediaPipe, Arduino, Control Systems

- Designed a closed-loop vision-to-actuation pipeline using PD control with encoder feedback to mitigate perception noise and latency.
- Analyzed tracking error and stability under sensor delay and actuator saturation; validated control behavior in simulation and hardware.

ROS2 Mobile Robot: State Estimation and Control
C++, ROS2, Navigation, Control

- Built a ROS2-based mobile robot integrating state estimation, motion control, and navigation pipelines.

Technical Skills

Programming: C++, Python, C, Bash, Git, CMake, Bezel
Robotics: ROS2, MuJoCo, Gazebo, PyBullet
Control: Kinematics, trajectory planning, PID/PD control, real-time systems
Systems: CAN, Embedded Linux, multithreading, ESP-IDF (ESP32), FreeRTOS

Licenses & Certifications

Robotic Software Engineer Nanodegree — Udacity (Jan 2023)

Python for Everybody Specialization — University of Michigan (May 2022)

Leadership

Gas Monkeys Racing — Team Captain
SAE BAJA — *2019 – 2023*

- Led system integration, DFMEA-based safety analysis, and competition operations for a student off-road vehicle team.