Pushkar Dave

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SKILLS

Programming: Python, C, C++, MATLAB, C#, Git, Bash, Linux, Docker, Unit Testing
Robotics: ROS2, ROS, Raspberry Pi, PIC32, Arduino, CoppeliaSim, Gazebo, Unity, RViz, Onshape(CAD)
Libraries: NumPy, Matplotlib, PX4-Autopilot, MoveIt, SymPy, ModernRobotics, OpenCV, PyTorch, Genesis

EDUCATION

Northwestern University — Sept 2024 - Dec 2025(Expected)
Master of Science in Robotics — *Evanston, IL, USA*

Visvesvaraya National Institute of Technology — Dec 2020 - May 2024
Bachelor of Technology in Electrical and Electronics Engineering — *Nagpur, India*

EXPERIENCE

Multi-robot Systems Group, Czech Technical University — May 2023 – Sept 2023
Research Intern — *Advisor: Dr. Martin Saska*
- Developed a C++ algorithm to estimate the position of a focal UAV in a swarm, mitigating noisy rangefinder data
- Integrated the novel UVDAR localization system and applied sensor fusion with a Linear Kalman Filter
- Recorded and analyzed data using rosbag and visualized UAV's tracked states with PlotJuggler

IvLabs, VNIT — Jul 2021 – Oct 2021
Summer Intern — *Advisor: Dr. Shital Chiddarwar*
- Created a PD control system for 3D quadrotor in MATLAB, enabling accurate tracking of linear and helical trajectories
- Generated and visualized a minimum snap trajectory using a seventh-order polynomial for the quadrotor model

PROJECTS

Collaborative Mapping using a Quadruped and Quadrotor — Jan 2025 - Mar 2025
- Created navigable occupancy maps by merging point clouds generated with RGBD odometry and mapping techniques
- Built a ROS2 C++ package for quadrotor offboard control, enabling autonomous indoor flight using MoCap integration
- Implemented lossless camera streaming between a Raspberry Pi and remote workstation using Zenoh DDS

Whack A Mole with 7-DOF Robot Arm — Nov 2024 - Dec 2024
- Led a team of 4 in developing a Python, ROS2 package for a Franka 7-DOF robot arm to play the whack-a-mole game
- Set up serial communication between a ROS2 node and Arduino to control a servo-driven hammer end effector
- Wrote a custom Python wrapper for the MoveIt2 API to plan, inspect, save and modify the robot's trajectories

Reinforcement Learning on a Quadruped — Feb 2025 - Mar 2025
- Developed and trained locomotion policies for the Unitree Go2 quadruped for tasks like jumping, strafing and crawling
- Implemented an Actor-Critic network structure, integrated into a Proximal Policy Optimization (PPO) algorithm
- Simulated and evaluated policies in Genesis simulator, tracking key metrics like mean reward per episode

Trajectory Generation using Particle Swarm Optimization — Feb 2025 - Mar 2025
- Applied Particle Swarm Optimization(PSO) in C++ to solve the Traveling Salesman Problem(TSP)
- Generated trajectories from an optimal set of waypoints using an open source trajectory-generation package
- Validated and deployed the trajectories on the CrazyFlie quadrotors in simulation

Feedback Control of Omnidirectional Mobile Manipulator — Oct 2024 - Nov 2024
- Generated a trajectory for the end effector of a 5-DOF robot arm to perform a pick-and-place task in CoppeliaSim
- Simulated the kinematics of the omnidirectional robot with odometry equations to determine its next configuration
- Implemented and tuned a feed forward PI controller to minimize the error between the current and desired robot states

ESP32 based Navigation Device — Mar 2023 - May 2023
- Developed a program to showcase animations synchronized with audio signals using an ESP32 and LED matrix display
- Integrated the Waze navigation app as an audio source, transmitting data to the ESP32 for real-time navigation display
- Utilised Fast Fourier Transform (FFT) to extract frequency components from an audio sample