

Vaibhav Nandkumar Kadam

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Education

Worcester Polytechnic Institute

Master of Science in Robotics Engineering. GPA 3.87/4

Worcester, MA

Aug 2022 - May 2024

Ramrao Adik Institute of Technology, Mumbai University

Bachelor of Engineering in Electronics Engineering. GPA 7.96/10

Mumbai, India

Aug. 2014 - May 2018

Skills

- **Software:** C++/C, Python, ROS2, Linux, Nav2, Bash, Pytorch, Tensorflow, Git, Docker, Gazebo, Eigen, gdb
- **Hardware:** Ouster OS1, NVIDIA Jetson Orin AGX/NX, CAN, Openzen IMU, FPGA, Intel Realsense, OAK-D

Experience

Danfoss - Autonomy

Autonomy Systems Intern, Skills C++, ROS2, Behavior tree, 3D Lidar SLAM

Minneapolis, USA

May 2023 - Present

- Developed decision making architecture in Danfoss Autonomous Control Library (C++) using behavior trees. Migrated to ROS2 and integrated lateral controllers, obstacle detection, line follower packages.
- Leveraged Gazebo simulations & deployed on Syslogix (Nvidia Orin AGX) for off-highway autonomous vehicles. Delivered drive-by-wire based vehicle motion control interface with pacmod ECU & Danfoss embedded controller XM100 facilitating safety conditions.
- Evaluated & implemented 3D SLAM algorithms & 3rd party solutions for better mapping and accuracy in indoor and outdoor cluttered environment. Delivered ROS2 C++ driver for Hemisphere v200n GNSS to parse NMEA2K PGN msgs.

Peppermint Robots

Senior Robotics Engineer, Skills - Motion Planning & Path Tracking, ROS/ROS2, C++, Git

Pune, India

July 2021 - July 2022

- Contributed to planning & controls of industrial floor cleaning & material movement AGV autonomy stack, focused obstacle avoidance local planner using Motion primitives. Addressed safety edge cases and collision prediction.
- Developed user interface for deployment for floor cleaning robots, used boustrophedon decomposition for coverage path planning given safe and no-go zones.

Adaptive & Intelligent Robotics Lab

Research Assistant supervised by Prof. Jing Xiao, Skills - Sensor Fusion, Path Planning

Worcester, USA

Jan 2023 - Dec 2023

- Devised and implemented a local planning algorithm for autonomous underground power cable path detection.
- Improved accuracy by 90 % with kalman filtering, integrated with Pure Pursuit Control considering safety conditions
- Developed a A* based global planner algorithm that parsed power cable GIS data to validate with local cable path, facilitating path planning from user-specified start to target points from QT/QML User Interface.

Autonomous Robots & Multi-Agent Systems Lab, IIT Bombay

Research Assistant supervised by Prof. Leena Vachhani, Skills - Nonlinear Control, System Modelling

Mumbai, India

July 2018 - July 2021

- Designed a Nonlinear Feedback Linearization controller for Spherical Robot a under-actuated system using to reduce wobbly motion. Granted two patents for Scalable design & Novel placement of wide-angle camera inside spherical robot.

Major Projects

Saliency Object Detection using Attention: Implemented an modified attention U2Net model for saliency object detection.

Multi-Agent Path Finding for Large Scale warehouses: Implemented Conflict Based Search algorithm and its variants in grid environment. Explored centralized and decentralized algorithms for Multi-Robot Path Finding and task allocation.

Robust Trajectory Tracking for UAV & Manipulator: Designed sliding mode controller to for Quadrotor UAV to track desired trajectories in the presence of external disturbances. Implemented Feedback Linearization, Robust and Adaptive Controller for two link robot manipulator.

Valet Vehicle Parking using Hybrid Astar: Implemented Hybrid-Astar for planning Differential drive, Ackermann & Truck-Trailer configuration considering non-holonomic kinematic constraints developed in C++ ROS2.

Patents & Publications

- **Earthquake Rescue and Relief Operations Robot**, Indian Patent 446857, **Granted August 23, 2023** with RAIT
- **A Robot System with Upwards Facing Camera**, Indian Patent 462647, **Granted October 27, 2023.** with IIT-B
- **Methods for Scaling Spherical Robot**, Indian Patent 507996, **Granted February 07, 2024.** with IIT-B
- **Vaibhav N. Kadam, L. Vachhani and A. Gupta, "Control of an Omnidirectional Mobile Base with Multiple Spherical Robots,"** 2019 Sixth Indian Control Conference (ICC), 2019, Hyderabad, India.
- **Vaibhav N. Kadam, P. S. Jadhav, A. D. Ghatpande, et. al. "Closed Loop Control of Unstable Omni Directional Assisting System,"** 2018 4th International Conference for Convergence in Technology (I2CT), 2018, Ujire, India.