Vaibhav Raheja

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EDUCATION

University of Illinois Urbana-Champaign Aug 2023 – Dec 2024
Master's of Engineering **Autonomy and Robotics** GPA: 3.66/4 Champaign, USA

Mukesh Patel School of Technology Management & Engineering Jul 2019 – Jun 2023
Bachelor of Technology in Computer Engineering GPA: 3.66/4 Mumbai, India

PROFESSIONAL EXPERIENCE

Intelligent Motion Laboratory Aug 2023 – Dec 2023
Robotics Research Developer Champaign, USA

- Implemented advanced facial detection algorithms (FaceMesh) for **robotic eye examinations**, improving head pose estimation accuracy by 30%.
- Designed a custom camera mount for a UR5 robotic arm, optimizing image capture for eye tracking and increasing examination precision by 20%.
- Developed a real-time head pose estimation system using a **ZED depth camera**.

All India Institute of Medical Sciences (AIIMS) Hospital Feb 2021 – May 2023
Robotics Research Assistant Mumbai, India

- ICMR is the Indian equivalent of the **US National Institute of health**.
- Developed a novel **robot-assisted intubation system**, enhancing procedural safety and efficiency, resulting in a 30% reduction in operator dependency during critical care intubation procedures.
- Designed a **custom catheter and mouthpiece** integrated with a high-resolution camera, boosting patient safety and real-time visualization.

PROJECTS

Intelligent Ground Vehicle Competition (IGVC)
Python, ROS, OpenCV, PID Control, Path Planning, CAD

- Led a team as captain in an international robotics competition, developing SOCRATES 2.0 with a central drivetrain design achieving an average speed of 2.4 km/h.
- **Secured 2nd and 3rd place in Cyber and Auto-Nav Challenge** categories, implementing autonomous navigation with lane and object detection along with GPS Navigation, achieving over 95% navigation accuracy.

Benchmarking Control Algorithms for Unitree Go1 Robot
Python, ISAAC Sim, Reinforcement learning

- Implemented a benchmarking framework for evaluating Factory Controller and Reinforcement Learning (RL) algorithms on the Unitree Go1 robot, **improving adaptability and efficiency by 25% in varied terrains**.
- Conducted performance analysis of "Walk These Ways" RL-based control algorithm, achieving a 30% improvement in velocity tracking and robustness over factory settings in challenging outdoor environments.

Autonomous Race Car
Python, Path Planning, Vehicle Control, CARLA Simulator, PID Control

- Integrated **path planning algorithms for autonomous navigation** on a Formula 1 racetrack in the CARLA simulator, utilizing Hybrid A*, Spline Interpolation, and BFS, achieving a maximum score of 92.4 on the Shanghai track.
- **Optimized a PID controller for steering and throttle**, leading to smoother trajectory following and a 25% reduction in lateral error during high-speed cornering maneuvers.

Dishwasher Robot
Python, ROS, Gazebo, Pose Estimation, MoveIt

- Developed a simulation-based automated robotic system for loading dishes into a dishwasher, **integrating pose estimation and motion planning algorithms**, resulting in a 25% improvement in trajectory planning efficiency for domestic task automation.
- Integrated a sampling-based strategy for gripper pick-up locations, overcoming challenges in algorithm compatibility and precision

SKILLS

Programming: Python, C++, OpenCV, PyTorch, Machine Learning (ML), Convolutional Neural Networks (CNN)

Robotics Frameworks and Tools: Robot Operating System (ROS/ROS2), Gazebo, Path Planning, Vehicle Control, Reinforcement Learning, Control Algorithms, Simultaneous Localization and Mapping (SLAM)

Tools: Autodesk Fusion 360, Computer-Aided Design (CAD), Linux, Git, Arduino, Raspberry Pi, 3D Printing

PUBLICATIONS

V. Raheja, V. Shah, M. Shetty, P. Patel, and M. Tiwari, "Multi-Disease Prediction System using Machine Learning," 2022 International Conference on Futuristic Technologies (INCOFT), Belgaum, India, 2022, pp. 1-6, doi: 10.1109/INCOFT55651.2022.10094382 .