Venkata Harshavardhan Bontalakoti

✉ vbontal1@jh.edu | ☐ (+1) 410-908-8940 | ○ GitHub | in LinkedIn-Harshavardhan | ⊕ Portfolio

Education

Johns Hopkins University, U.S.A | Masters Robotics Engineering	Aug'25 - Present
Indian Institute of Technology, Hyderabad, India | Bachelors Mechanical Engineering(Exchange)	Aug'24 - May'25
National Institute of Technology, Silchar, India | Bachelors Mechanical Engineering	Dec'21 - May'24

Work Experience

Indian Institute of Technology Madras, India　　　　　　　　　　　　　　　　　May'24 - Jul'24
Robotics Research Intern | Research and Development

- Won the prestigious **Summer Fellowship (SFP-2024)** at the Department of Aerospace Engineering, standing out among **1000 plus applicants** for excellence in robotics research.
- Developed a **ROS2-integrated simulation platform** in **Unity**, implementing **trajectory tracking controllers**, real-time feedback loops, and **PID-based path following** under simulated wind/wave disturbances.
- Improved **state estimation** and localization robustness via **sensor fusion** and evaluated real-time performance of waypoint-based navigation resulting in **12.5%** reduction in deployment time for marine drones.

Instruments Research and Development Establishment, DRDO, India　　　　　　　May'23 - Jul'23
Robotics Engineer Intern | Military and Defence Applications

- Contributed to the **design and control analysis** of **sensor-mounting systems** for autonomous aerial, ground, and naval platforms, emphasizing **active vibration isolation**, high-precision **feedback control**, and sensor stability for robust performance.
- Assisted in developing a **hardware-software integration pipeline** for deploying and calibrating **multi-sensor payloads**.
- Conceptualized an **autonomous coastal surveillance** system employing distributed, sensor-equipped ocean buoys with **real-time detection** and **adaptive control algorithms**, reducing operational costs by **30%** while enhancing perimeter awareness through networked state monitoring.

Projects

Quadruped Robot: Control Systems, SLAM, and Real-Time Sensor Fusion　　　　　　　[GitHub]
ROS2, Trajectory Control, EKF, IMU/Camera Fusion, Visual Odometry, MuJoCo, Gait Planning

- Developed a 12-DOF quadruped robot with onboard **state estimation** and **EKF-based IMU and camera fusion**, enabling **feedback-controlled, localization-aware locomotion** over challenging and dynamic terrain.
- Implemented a **ROS2-enabled control architecture** integrating **visual odometry**, **trajectory tracking PID controllers**, and **real-time perception-guided path planning** for fully autonomous, adaptive navigation.
- Enabled interactive object manipulation using **YOLO-based object detection** and **pose estimation**, employing **closed-loop control** for robust and reliable operation in unstructured environments.

Motion Control and Trajectory Optimization for Simulated ABB IRB 1200 Arm　　　　　[GitHub]
ROS2, MoveIt, RViz, C++, PID Control, Motion Planning, Industrial Manipulation, Gazebo

- Simulated an **ABB IRB 1200 robotic arm** in **ROS2** and designed **trajectory planning algorithms** using **MoveIt** for both **joint-space** and **Cartesian-space** end-effector control.
- Tuned and evaluated **motion controllers** and **PID parameters**, visualized **collision-free path planning** and **trajectory execution** in **Gazebo**, enabling precise, feedback-driven manipulation in industrial simulation scenarios.

Closed-Loop Visual Servoing and Human-Guided SLAM with TurtleBot3　　　　　　　[GitHub]
ROS2, Gazebo, PID/PD Control, Visual SLAM, Computer Vision, Human Pose Estimation, RViz

- Enabled **autonomous SLAM mapping** by integrating **human pose estimation** (TFLite) with **TurtleBot3**, allowing the robot to follow and map based on real-time human motion cues.
- Designed and implemented a **PD-controlled visual servoing pipeline** in ROS2, enhancing mapping speed by **32%** over manual methods.

Achievements

- **Academic Exchange Scholar, Indian Institute of Technology Hyderabad** : Selected for a prestigious academic exchange awarded to the **top 10%** students post-junior year based on **academic excellence and research interest**.
- **Smart India Hackathon 2024 Winner (Hardware Edition)**: Engineered a **drone-based automation** system addressing a real-world smart automation challenge; selected among the **top 7 teams** out of 30 nationally.

Technical Skills

Programming: C/C++, Python, Matlab, C#, Linux, CMake, Git/GitHub, Docker

Robotics & Controls: ROS2, Gazebo, Mujoco, SLAM, MoveIt, Sensor Fusion, PID Control, Optimization, UART

AI & ML: PyTorch, OpenCV, TensorFlow, Stable Baselines3, SciPy, Pandas, Matplotlib, YOLO, Reinforcement Learning

Publications

1. **Improvement in Multi-resident Activity Recognition System in a Smart Home Using Activity Clustering**, *Topics: Machine Learning, Deep Learning, Multi-Modal Learning*　　　　　　　[Paper]