Venkata Harshavardhan Bontalakoti

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Education

Johns Hopkins University, U.S.A | Masters Robotics Engineering — Aug'25 - Present
Indian Institute of Technology, Hyderabad, India | B.Tech in Mechanical Engineering(Exchange) — Aug'24 - May'25
National Institute of Technology, Silchar, India | B.Tech in 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.
- Built a **ROS2-integrated simulation platform** in **Unity** with support for **SLAM, trajectory following**, and **multi-agent coordination** under wind/wave disturbances.
- Enhanced **localization robustness** using **sensor fusion** and tested **waypoint-based navigation** strategies with **perturbation modeling**, 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 analysis** of **sensor-mounting systems** for **autonomous aerial, ground, and naval platforms**, with a focus on robustness, vibration isolation, and accuracy.
- Assisted in developing a **scalable hardware-software integration pipeline** for deploying **multi-sensor payloads** (**EO/IR cameras, LiDAR**) on mobile platforms.
- Conceptualized an **autonomous coastal surveillance** system using distributed **sensor-equipped** ocean buoys, **reducing operational costs** by **30%** while enhancing perimeter awareness and **real-time detection** capabilities.

Projects

SLAM-Enabled Quadruped Robot with Real-Time Sensor Fusion [GitHub]
ROS2, EKF, IMU Fusion, Visual Navigation, MuJoCo, YOLO, MoveNet

- Built a 12-DOF quadruped robot with onboard **EKF-based IMU-camera fusion** for robust **localization-aware locomotion** in dynamic terrain.
- Developed a **ROS2 navigation pipeline** integrating **visual odometry**, PID stabilization, and **real-time perception-guided path planning**.
- Enabled interactive object manipulation using **YOLO detection** and **pose estimation**, targeting **field deployment in unstructured environments**.

Trajectory Planning with Simulated ABB IRB 1200 Arm using MoveIt in Gazebo [GitHub]
ROS2, MoveIt, RViz, C++, Motion Planning, Industrial Manipulation, Gazebo

- Simulated an **ABB IRB 1200 robotic arm** in **ROS2** and implemented **trajectory planning** using **MoveIt** with **Joint-Space** and **Cartesian goals**.
- Tuned **motion planners** and visualized **collision-free trajectories** in **RViz**, enabling precise path execution in manufacturing-like environments.

Drone Path Planning using RRT in Webots with ArduPilot SITL [GitHub]
Webots, PyMAVLink, ArduPilot SITL, RRT, Python, UAV Navigation, Path Planning

- Implemented **Rapidly-Exploring Random Tree (RRT)** algorithm for autonomous drone navigation in **Webots 3D simulation environment**.
- Integrated **ArduPilot SITL** via **PyMAVLink** to bridge simulated motion planning with real-world autopilot firmware.

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: ROS2, Gazebo, Mujoco, Unity, SLAM, Nav2, Moveit, UART, AMCL, Optimization, Sensor Fusion

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]