Pranav Vivek Malpure

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TECHNICAL SKILLS

Languages/Frameworks C++, Python, MATLAB, Robot Operating System (ROS), ROS 2, Git, Embedded Linux

Packages and Libraries Numpy, Pandas, SciPy, NLTK, pyvisgraph, Pytorch

Softwares and Simulators Gazebo, RViz, dm_control-MuJoCo, Maniskill-SAPIEN

WORK EXPERIENCE/INTERNSHIP

Flytbase Labs | *Robotics Research & Development Intern* | *UAVs* *(Jun'23 - Jul'23)*

- **Optimized** real-time addition of NFZs resulting in **reduction** of computing time by **92%** by grouping visibility graphs
- Formulated a Python class for integrating **city-wide** visibility graphs by innovatively integrating **Geofences** and **NFZs**
- Developed an algorithm that assesses reachability of subsequent waypoints online and optimizes return-to-home decisions

KEY PROJECTS

Vision based RL for manipulation | *UCSD Existential Robotics Laboratory* *(Oct'24 - Present)*

Graduate Student Researcher

- Integrated **DrQ-v2**'s image-based data augmentation techniques into the **SAC** policy for a PickCube task in **ManiSkill**
- Implemented RL policy for the **16** joint **Allegro** hand to enable it to grab a cube by tuning rewards in a staged manner
- Working on implementing 3D **diffusion** policy for combining 3D data and denoising actions trained on imitation learning

Visual-Inertial & LiDAR-based SLAM | *UC San Diego* *(Jan'25 - Mar'25)*

- Developed **EKF**-based SLAM framework for **real-time** vehicle trajectory estimation using stereo cameras & IMU data
- Implemented ICP-based LiDAR **scan matching** for relative pose estimation & refined the trajectory using **Factor-Graph** SLAM (**GTSAM**) with loop-closure constraints
- Applied **sensor fusion** with Kalman filtering & camera projection models for robot and landmarks state estimation, generating 2D occupancy grid and texture map for enhanced perception

Perception based Pedestrian Intent Prediction | *UC San Diego* *(Apr'25 - Present)*

- Developing a modular deep learning pipeline for pedestrian **intent prediction** leveraging CNNs, attention mechanisms and GRUs, inspired from PIP-Net
- Integrating features like **object detection**, **body pose** estimation, **depth** segmentation and **optical flow** models to enhance safety in autonomous driving scenarios
- Leveraging PIE dataset to train and evaluate multimodal classifiers, also incorporating expected time to cross estimation

SLAM on Mobile Robot | *UC San Diego* *(Sept'24 - Nov'24)*

- Engineered **Kalman Filter** based **SLAM** from scratch on a Qualcomm RB5 robot using vision feedback via April tags
- Built **Roomba**-like robot for autonomous navigation & achieved **91.66**% area coverage via Boustrophedon path planning

The Humanoid Project | *Student Tech Team, IIT Bombay* *(Mar'22 - Apr'24)*

Team Lead

- Led a team of **20** students building a full sized humanoid robot to be deployed for **sorting** books in the central library
- Crafted roadmaps to ensure technical coordination between subsystems & oversaw budget allocation of INR **0.2 million**
- Designed a mechanism for grasping library books and simulated control algorithms for gait of the mobile base in Gazebo

Autonomous Navigation of UUVs | *Aerospace Dept., IIT Bombay* *(Jan'23 - Apr'23)*

- Implemented the **curvature velocity method** in python to navigate a UUV through static obstacles using ROS-Gazebo
- Leveraged data from **3** onboard **sonar** sensors to detect obstacles, enabling **real-time** adjustments of thrust & velocity

EDUCATION

- **University of California San Diego** *(Sept'24 - Dec'25)*
  Master of Science in Electrical and Computer Engineering | Intelligent Systems, Robotics & Controls *GPA: **3.40/4***
  Courses: Statistical Learning-I, Introduction to Robotics, Linear Systems Theory, Sensing/Estimation in Robotics, Linear Algebra, Visual Learning, Planning/Learning in Robotics
- **Indian Institute of Technology Bombay, India** *(Nov'20 - Aug'24)*
  Bachelor of Technology with Honours, Aerospace Engineering *GPA: **8.06/10***
  Minor in Systems & Controls Engineering
  Courses: Navigation & Guidance of UAVs, Embedded Robotics, Reinforcement Learning, Intelligent Feedback & Control
  ***Achievements**: Ranked **1981** in India out of **1 million** candidates in the Joint Entrance Examination (2020)*