VISHNU ROHIT ANNADANAM

Boston, MA • +1-8577012906 • annadanam.v@northeastern.edu • vishnurohit87.github.io • linkedin.com/in/vishnurohit87

EDUCATION

Master of Science, Robotics | Northeastern University, Boston, MA | GPA – 3.7/4 **Expected Dec 2024**

Coursework: Autonomous Field Robotics, Mobile Robotics, Computer Vision, Control Systems, Robotics Sensing & Navigation.

Bachelor of Engineering, Electronics & Telecommunication | University of Mumbai, India | GPA – 8.4/10 **Jun 2022**

Coursework: Neural Networks & Fuzzy Logic, Image Processing & Machine Vision, Discrete Time Signal Processing.

EXPERIENCE

Research Assistant [incl. Internship] | Field Robotics Lab, Northeastern University, Boston, MA **Dec 2023 – Present**

- Led the design and development of a multi-UAV swarm system for dynamic mapping, with a dual RGB camera setup for stereo vision on each drone and ensuring precise time synchronization across all cameras and platforms.
- Developed a Python and ROS2 based control architecture to achieve coordinated formation flight with real-time camera feedback and target tracking using the ArduPilot systems running on the Pixhawk 6X flight controllers.
- Calibrated camera intrinsic and extrinsic parameters for the stereo setup before each mission to get accurate depth estimation for optimal 3D reconstruction and mapping.
- Generated photorealistic 3D models of static scenes using 3D Gaussian Splatting, from optimized sparse point clouds produced by Structure from Motion (SFM) algorithms.
- Benchmarked state-of-the-art Visual SLAM algorithms such as NVIDIA ISAAC SLAM on the on-board Nvidia Jetson Orin Nano to evaluate real-time performance on edge devices.

Graduate Teaching Assistant – Robotics Sensing and Navigation | Northeastern University, Boston, MA **Sep 2023 – Present**

- Guided students on data acquisition using ROS/ROs2 and analysis techniques for IMU, GNSS, RTK GPS, Camera and LiDAR sensors.
- Led discussions on core robotics concepts such as localization, mapping, path planning, computer vision, optimization, etc. and their state-of-the-art algorithms.

Computer Vision & IoT Intern | EdVerb Learning Pvt. Ltd, Mumbai, India **Feb 2022 - Mar 2022**

- Built multiple Computer Vision and TinyML projects leveraging the ESP-32 Cam to create practical applications such as Face Detector, Eye Detector & Tracker, Flower Classifier, etc.
- Programmed the ESP-32 board to interface these projects with multiple sensors to devise several cost efficient IoT-based solutions for automation.
- Designed and programmed movement of a miniature car to automatically detect and avoid obstacles using Arduino Nano and ultrasonic sensors; developed components such as, LDR-enabled Smart Headlights, IR Remote Control.

TECHNICAL SKILLS

Operating Systems & Software: ROS/ROS2 (Robot Operating System), Linux, Git, Docker, Gazebo, Raspberry Pi, Fusion 360.
Programming Languages & Libraries: Python, C++, MATLAB, OpenCV, PyTorch, GTSAM, NumPy, Matplotlib, SciPy.
Proficiencies: Robotics, Computer Vision, Deep Learning, System Design, Motion Planning, Machine Learning, CAD, 3D Printing.

PROJECTS

3D Point Cloud Reconstruction from 2D Images through Structure from Motion

- Developed a 3D reconstruction algorithm that performs Structure from Motion to create a sparse point cloud from 2D images captured with a phone camera, using OpenCV for processing and GTSAM for optimization.
- Matched features between images using SIFT and RANSAC to estimate camera poses using essential matrix and Perspective-n-Point (PnP) pose computation, and triangulate their inlier feature points into 3D space.
- Optimized the point cloud by performing global Bundle Adjustment using GTSAM's factor graphs with LM algorithm to improve camera poses and 3D landmarks from the initial triangulation, achieving a 94.5% decrease in reprojection error.

GPS & IMU Sensor Fusion for Automotive Dead Reckoning

- Built and deployed custom Python based ROS2 drivers for real-time sensor data acquisition from GPS and IMU mounted on a vehicle for localization and navigation tasks.
- Analyzed IMU's noise characteristics through Allan Variance and calibrated magnetometer by correcting hard and soft iron distortions along with error compensation in IMU and GPS data.
- Compensated for accelerometer bias to estimate vehicle's forward velocity, and fused yaw angle computed from gyroscope and magnetometer data to estimate heading for Dead Reckoning with IMU.
- Performed sensor fusion by implementing Extended Kalman Filtering (EKF) to get an improved estimate of vehicle's overall trajectory including GPS-lacking environments.

Autonomous Disaster Response Reconnaissance Bot

- Applied techniques of mobile robotic kinematics and sensing, motion planning and SLAM, to conduct autonomous reconnaissance in an initially unknown simulated disaster environment using a TurtleBot3.
- Utilized a 360° LiDAR with custom ROS nodes and existing packages to achieve robust and efficient exploration, integrating sensor data for comprehensive environment mapping.