

MAYANK SHARMA

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Education

University of Maryland, College Park Master of Engineering in Robotics	Aug 2022 - May 2024 GPA: 3.54/4.00
NMIMS University, India Bachelor of Technology in Mechatronics	Aug 2018 - May 2022 GPA: 3.65/4.00

Experience

Robotics Algorithms & Autonomous Systems Lab, University of Maryland Graduate Student Researcher	March 2024 - Present Advisor: Prof. Pratap Tokekar
<ul style="list-style-type: none">Improving object mapping and reconstruction with a mobile robot using Next-Best-View (NBV) planning, utilizing deep learning and Gaussian splats to predict full models efficiently from partial views without assuming they are centered at the object's center.	
Kick Robotics, College Park, MD Computer Vision Engineer Intern	Feb 2024 - Present
<ul style="list-style-type: none">Developing a autonomous mobile robot to explore and map a warehouse with RTAB-Map pipeline using LiDAR, IMU, Depth Camera, Nvidia Jetson, and ROS2 to monitor carbon monoxide levels.	
Lighter than Air Systems Lab, Indian Institute of Technology, Bombay Robotics Engineer Intern	July 2021 - Aug 2022 Advisor: Prof. Rajkumar Pant
<ul style="list-style-type: none">Designed CAD, manufactured and developed firmware for novel and modular mid-air UAV docking and battery swapping mechanism increasing UAV flight time from 60 minutes to 30 days.Performed precision landing in ROS gazebo using ARUCO tags and OpenCV to achieve landing accuracy of +/-40cm.	

Projects

SLIC and Image Segmentation Network Github <i>Python, PyTorch, OpenCV</i>
<ul style="list-style-type: none">Executed superpixel image segmentation with SLIC and k-means algorithms.Leveraged ResNet18 as backbone to create a SLIC superpixel image segmentation network for super pixels achieving 85% accuracy.
3D Time to Collision using Sensor Fusion <i>C++, Eigen, PCL, OpenCV</i>
<ul style="list-style-type: none">Detected and tracked objects in 3D space from the benchmark KITTI dataset based on camera and lidar measurements.Computed time-to-collision on both camera and lidar sensors by projecting 3d lidar points on to camera sensor.Identified the best combination of keypoint detectors and descriptors for object tracking.
Neural Radiance Fields for View Synthesis (NeRF) <i>Python, PyTorch, OpenCV</i>
<ul style="list-style-type: none">Developed a fundamental implementation of Neural Radiance Fields (NeRF) to synthesize novel views of intricate 3D scenes using only a sparse set of input views
Auto Pano <i>Python, PyTorch, OpenCV</i>
<ul style="list-style-type: none">Implemented panorama stitching algorithm using traditional (Homography estimation using feature points) and deep learning (HomographyNet: Supervised and unsupervised) methods.
Structure from Motion Github <i>Python, OpenCV</i>
<ul style="list-style-type: none">Reconstructed a 3D scene from a given set of images by feature correspondence with RANSAC-based outlier rejection along with triangulation and nonlinear optimization techniques for robust camera pose estimation.
Camera Calibration Github <i>Python, OpenCV</i>
<ul style="list-style-type: none">Implemented Zhang's and Tsai's camera calibration methods which resulted in a mean re-projection error close to 0.5 pixels. Used SVD for getting an initial estimate of calibration parameters and Maximum Likelihood Estimation(MLE) for optimization.
ARIAC Agility Challenge <i>Python, C++, MoveIt, ROS2</i>
<ul style="list-style-type: none">Used MoveIt motion planning and ROS Services to pick and place bin parts using UR5 robot and submitted orders using AGVs.
Cyber Shopper Github <i>Python, ROS2, MATLAB</i>
<ul style="list-style-type: none">Executed pick-and-place operations for grocery items utilizing a mobile robot featuring a UR5 arm in ROS2 Gazebo and employed inverse kinematics to ensure precision in robotic manipulation.Used Peter Corke's Toolbox in MATLAB to validate forward and inverse kinematics of the UR5 arm.

Technical Skills

Languages: Python, C, C++, MATLAB

Software Tools: ROS (Robot Operating System), Blender, Git, Docker, CI/CD, Gazebo, Cmake, SolidWorks, Fusion 360, AutoCAD

Libraries: PyTorch, Pandas, Sklearn, NumPy, Matplotlib, OpenCV, open3D

Deep Learning Architectures: VGG16, ResNet, DenseNet, HomographNet, SfMLearner, LSTM, NeRF

Publications

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- Khojasteh Z. Mirza, Mayank Sharma, Saurabh V. Bagare, Dhwanil Shukla and Rajkumar S. Pant. **A Study on Autonomous Mechanisms for Swapping of Batteries on Unmanned Aerial Vehicles**, AIAA 2023-1142. AIAA SCITECH 2023 Forum. January 2023.
 - Saurabh V. Bagare, Khojasteh Mirza, Mayank Sharma, Dhwanil Shukla and Rajkumar Pant. **Design of Mobile Docking Mechanism for Unmanned Aerial Vehicles capable of Vertical Take-off and Landing**, AIAA 2022-4063. AIAA AVIATION 2022 Forum. June 2022.