RAJ SURYA RAJENDRAN KATHIRVEL

+1(763)306-9042 | rajsurya1012@gmail.com | rajsurya1012.github.io |linkedin.com/in/rajsurya002 | Minneapolis, MN

EDUCATION

University of Minnesota, Twin Cities **Sep 2023 - May 2025**
Master of Science, Robotics (GPA: 4.0/4.0) *Minneapolis, MN, USA*
Coursework: Computer vision, Robot vision, Advanced machine learning, Deep Learning for robot manipulation

Indian Institute of Technology, Palakkad **Aug 2019 – May 2023**
Bachelor of Technology, Mechanical Engineering (CGPA: 8.67/10.0) *Palakkad, Kerala, India*
Coursework: Control of Robotic Manipulators, Motion planning of wheeled robots, Robot Implementation Methods

EXPERIENCE

Graduate Research Assistant *Jan 2024 – Present*
Robotics Perception and Manipulation Lab *University of Minnesota, USA*
- Utilized deep learning models for segmentation and detection using PyTorch to develop 3D scene understanding.
- Leveraged this capability to perform long-horizon mobile manipulation tasks using SPOT robot.

Robotics Engineering Intern *May 2024 – Aug 2024*
Milwaukee Tool *Milwaukee, WI, USA*
- Developed 3D perception system in C++ and Python to estimate 6DoF pose of target object within 1mm accuracy using 3D point cloud from RGBD camera, utilizing the ROS framework for integration.
- Integrated RTK GNSS with dual antenna setup to accurately determine the position and heading of outdoor robot, enabling accurate mapping of obstacles and boundaries.
- Collaborated with a cross-functional team to seamlessly integrate into real robots.

Undergraduate Research Assistant *Aug 2021 – Jan 2022*
Indian Institute of Technology, Palakkad *Palakkad, India*
- Developed motion model of swerve drive robot and validated in simulation.
- Integrated the motion model, utilizing ROS framework, with mapping and localization algorithm for SLAM to enable autonomous navigation of the robot.

Robotics Intern *Jun 2021 – Jul 2021*
UST *Trivandrum, India*
- Developed different testing environments in simulation for autonomous ground vehicles to identify failure conditions of the localization and perception algorithm.
- Analyzed failure cases and helped improve the localization and perception of the robot.

PROJECTS

Optimization of HRNet for deep models | /projects/HRSNet/ *Jan 2024 – May 2024*
Tools: PyTorch, Python, GPU, NumPy, Pandas, MatPlotLib
- Implemented HRNet, a CNN-based deep learning model, in PyTorch for classification and object detection tasks, achieving results comparable to the original model.
- Introduced preactivated residual units that reduced loss and led to faster convergence with deeper models.
- Enhanced model performance by adding residual connections between HRNet stages.

Formation Control using Vision Tracking | /projects/Vision_Drone_Control/ *Sep 2023 – Dec 2023*
Tools: OpenCV, NumPy, Python, ROS, Gazebo
- Developed a perception pipeline for instance segmentation in multi-robot environment using RGB camera.
- Utilized camera intrinsics and projective geometry to accurately determine the 2D pose of the robot.
- Developed a controller to move the set of robots, achieving accurate geometric constraint adherence.

Pick and Place using RRT Connect *Sep 2023 – Dec 2023*
Tools: Kineval, Javascript
- Implemented path planning for a mobile manipulator using RRT Connect for efficient pick and place tasks.
- Developed inverse kinematics to control arm motion with precision.

Vision-Based Multi Drone Control | /projects/Formation_Tracking/ *Sep 2023 – Dec 2023*
Tools: Python, OpenCV, RGB Camera, Git
Silver Medal at the InterIIT TechMeet 11.0, a nationwide competition
- Developed teleoperation module for drone control using MSP Communication protocol
- Implemented 6D pose estimation for multiple drones using ArUco marker and RGB Camera.
- Designed path planning algorithm to navigate through waypoints and trace master drone autonomously.

SKILLS

Languages: Python, C++, MATLAB, JavaScript

Libraries/Frameworks: ROS, PyTorch, Tensorflow, Pandas, NumPy, OpenCV, MoveIt, Open3D, PCL

Robots and Sensors: Spot, Nano drones, Turtlebot, xARM, AMR, LiDAR, RGBD Camera, IMU, GNSS

Other: Linux, Git, Gazebo, Azure DevOps, Rapid prototyping, AutoCAD, Fusion360, Simulink