RAHUL ROY

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EDUCATION

Northwestern University **Evanston, IL**
M.S. in Robotics GPA 3.86 *Expected December '24*

Manipal Institute of Technology **Manipal, India**
B.Tech. in Mechatronics Engineering - Minor in Robotics and Automation GPA 3.75 *June '18- July '22*

Relevant Coursework

ROS (Robot Operating System)/ROS 2, Robotic Manipulation, Mechatronics, Microprocessor System Design, SLAM for Robotics.

PROJECTS

Autonomous Exploration and Detection in an Unknown Environment | *C++, Python, ROS* 2 *Jan '24 - March '24*

- Programmed a Quadruped (Unitree Go1) to autonomously explore unknown environments in ROS 2, Python and C++.
- Implemented Lidar, camera fused graph based 3D SLAM with ICP Odometry using RTAB-MAP for autonomous navigation.
- Developed a custom exploration algorithm based on Frontier Exploration, integrated with the Nav2 stack for obstacle avoidance.
- Trained a YOLOv8 machine learning model to identify humans within the environment and display their position as markers in Rviz2.
- Developed a facial recognition package using DeepFace to store and compare faces of individuals.

Simultaneous Localization and Mapping from Scratch (EKF SLAM) | *C++, ROS* 2 *Jan '24 - March '24*

- Developed an EKF SLAM (2D SLAM) pipeline using ROS 2 and C++ for the Turtlebot3.
- Created a kinematics and odometry control library in C++ for differential drive robots.

Vision-based Autonomous Control of a 7 DOF Robot Arm | *Group Project* | *Python, ROS* 2 *Dec '23*

- Programmed a 7 DOF Franka Arm in Python and ROS 2 to autonomously detect and knock down colored bowling pins.
- Trained YOLOv8 machine learning model for classification and detection of the colored bowling pins, displayed as markers in Rviz2.
- Developed a Python API for the ROS 2 MoveIt package to control the robot's movements.

Motion Controlled Differential Drive Car with Infrared (IR) Gripper | *Group Project* | *C* *Dec '23*

- Coded a microcontroller in C to control a differential drive car with an autonomously operated IR gripper.
- Transmitted Euler angles via Radio communication to direct the car's movement based on tilt and inclination.
- Integrated IR Grid-EYE sensor for object detection, triggering servo-controlled gripper manipulation within the car's range.

PROFESSIONAL EXPERIENCE

Walt Disney Imagineering, Research and Development - Advanced Development **Glendale, California**
Robotics Graduate Intern *June '24 - Sept '24*

- Part of an early stage team involved with prototyping and building underwater robotic technologies
- Worked on setting up various sensors and implementing sensor fusion using Kalman Filters for the Underwater robot in Python
- Developing controls and algorithms to enable autonomous underwater navigation in Python

Centre for Artificial Intelligence and Robotics, Defence Research and Development Organisation **Bangalore, India**
Project Intern *Jan '22 - June '22*

- Set up IMU and Velodyne LIDAR for the Husky A200 robot using C++ and Python in ROS 2.
- Achieved autonomous navigation using SLAM Toolbox (2D SLAM), Cartographer, and Nav2 (ROS 2 Foxy) in C++.
- Performed a comparative study of the TEB and DWA motion planners for the proposed robot**.**

Central Research Laboratory, BEL **Bangalore, India**
Intern *July '21 - Aug '21*

- Implemented algorithms in MATLAB related to Robotic Navigation including Trilateration, Triangulation, and GPS.
- Manipulated UDP packets in MATLAB to send from one system to another.

SKILLS

- **Software**: Python, C++, C, Git, Linux, Unit Testing, Bash, MATLAB
- **Robotics**: *Software*: ROS 2/ROS, Nav2, Computer Vision, Machine Learning, MoveIt 2, Gazebo, SLAM, CoppeliaSim,YOLOv8, Path Planning, Sensor Fusion, RTAB Map, Pytorch, Semantic Segmentation, Visual Odometry, PCL, OpenCV, Ignition Gazebo, MuJoCo, Reinforcement Learning.
  Hardware: Microcontroller (nRF52833, PIC32), Unitree Go1, Nvidia Jetson, Franka Emika Panda, Sensor calibration.
- **Manufacturing**: Circuit design, 3D Printing, CAD (SolidWorks, Onshape).