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Patanjali Maithani

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EDUCATION

New York University, *Master of Science, Mechatronics and Robotics* | New York, USA GPA: 3.8/ 4.0 May 2024

Netaji Subhas Institute of Technology (NSIT),University of Delhi, *Bachelor of Engineering, Manufacturing Processes and Automation Engineering (MPAE)* | Delhi, India GPA: 7.85 / 10 June 2020

EXPERIENCE

Gen Auto AI, *Research Intern* |(New York, USA) September 2024 - present

- Developing Control laws for Autonomous Vehicle

New York University, *Researcher* |(New York, USA) Aug 2024 - September 2024

- Worked on Control Barrier Function based safe obstacle avoidance algorithms for robotic manipulators such as the UR16e and **Franka Research.**

Omnipresent Robot Tech, India, *Robotics Software Engineer* | (India) Sept 2020 - Sept 2021

- Improved the security, traceability, and integrity of the company's Remotely Piloted Aircraft Systems (RPAS) by augmenting the open-source software PX4 with **Public Key Infrastructure (PKI)** to meet Indian regulatory requirements.
- The aforementioned augmentation was directly applied to the PX4 source code (Pixhawk), which had previously been implemented on a Raspberry Pi (companion computer), thereby **increasing the flight time** and **reducing the power consumption** of the company's RPAS.
- Developed and documented the company's **NPNT (No Permission, No Take-off)** architecture to ensure compliance with Indian regulations.

Industrial Automation Lab (MPAE Department, NSIT), *R&D Intern* | (New Delhi, India) Jun 2019 - Sept 2019

- Worked on a project titled, **"Quaternion based estimation and disturbance observer-based control of attitude for a quadrotor"** in the requirement of the Internship.
- Simulated **disturbance-rejection-based PID** attitude control on a quadrotor using MATLAB.
- Executed **Multiplicative Extended Kalman Filter** for estimating orientation of quadrotor from noisy sensor measurements.
- Implemented a harmonic disturbance observer to detect and reject time-varying disturbances, making the quadrotor robust to external varying forces like wind gusts.

SKILLS

Languages	Python, C/C++, MATLAB
Software	Sophus, Eigen, g2o, Kalibr calibration, ROS/ROS2, RviZ, Gazebo, Moveit, PX4 Flight Stack(controller), MAVSDK, Linux, Matlab Simulink, Git,Docker, Latex

PROJECTS

Modified Rodrigues Parameters based Non Linear Disturbance Observer Control of Quadrotor(MATLAB)

- Designed a **robust global full degree of freedom discontinuous trajectory tracking controller** for a quadrotor using **control-lyapunov function** in MATLAB.
- Demonstrated the stability of the proposed control scheme through a rigorous **Lyapunov stability proof**, ensuring asymptotic convergence.
- Innovated a novel algorithm for the **upside-down orientation** of the quadrotor, making the take-off condition more versatile.
- Incorporated Non-linear Disturbance observer to make the controller robust to **exogenous disturbances**

Trajectory Tracking Controller for SCARA Manipulator(MATLAB)

- Generated **trapezoidal velocity profile** of the end-effector with anticipation time in the robot's operational space
- Deployed **Second order inverse kinematics** to compute desired joint position, velocity and acceleration.
- Derived equations of motion of the SCARA manipulator using first principles.
- Implemented **Inverse Dynamics Controller** in MATLAB/SIMULINK.
- Augmented a safety filter to the above control signal to avoid obstacle usinig **Control Barrier Function**.

Maze Navigation with Monocular Visual Odometry and VLAD(C++,Python)

- Implemented **Monocular Visual Odometry** in C++ for maze navigation and scene image tracking.
- Utilized **Vector of Locally Aggregated Descriptors (VLAD)** for efficient query image matching in the maze.

Safe Control of UR16e-Universal Robot(ROS2/c++/python/ZED2i)

- Objective is to ensure human safety around robotic manipulator.
- Human pose estimation using **ZED2i camera.**
- Calibrated ZED2i camera for Eye-On-Base scenario.
- Implemented **time-varying control barrier function** to prevent collisions with humans near the manipulator using **ROS2**.