

Praneet Nayak

Engineer | Mercedes Benz Research and Development India

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WORK EXPERIENCE

Mercedes Benz Research and Development India | Controls Engineer

Aug'23 - Present

- Conducting the **Hardware in Loop** Testing to validate the working of Rearwing and Brake Cooling Channel in AMG.
- Implemented a Rest BUS simulation of the Gear shift indicator and simulated primitive driving module in **CANoe**.

EDUCATION

Indian Institute of Technology Bombay | CGPA : 9.01

July'18 - Jun'23

Dual Degree (B.Tech + M.Tech) in Mechanical Engineering specializing in Computer Aided Design and Automation | Minor in Mathematics

RESEARCH EXPERIENCE

Lunar Lander Navigation | Masters Project

Sep'22 - Jun'23

The project aims to make the landing sequence of the Lunar missions completely autonomous, successfully simulated coasting period.

- Implemented a Visual based navigation method combining traditional **CV** and a **CNN** based method for pose estimation.
- Devised a **Back-stepping** non linear controller for the main Gimbaled Engine and **BOB** controller for RCS thrusters.
- Formulated the **Non Linear** optimization problem and solved using casadi for optimal path, used **EKF** for estimation.
- Modelled the entire simulation framework in MATLAB & Simulink, **Unreal Engine** was used to simulate virtual world.

HyperLoop | Student Technical Team | Propulsion Subsystem Engineer

July'19 - Dec'20

Team aiming to build a prototype of Hyperloop, Finalist in Desert Hyperloop Competition & were awarded Best paper in conference by UC Davis

- Designed a self levitating propulsion strategy using **Linear Induction Motor**, Simulated as a 2D problem in **COMSOL**
- Modelled a low weight **cold gas thruster** system, simulated the dynamics, iterated & optimized the design parameters

KEY TECHNICAL PROJECTS

Robotic EV Charger | JLR Robotic Challenge | Inter-IIT Tech Meet 11.0

Jan'23 - Feb'23

Part of the team of 10 members to design an autonomous robotic arm charger, emerged as first runner up in the contest

- Designed **6 dof** robotic arm with the camera mounted on the end effector, Implemented **A*** algorithm for path planning
- **YOLO** was used to detect the charging socket and **stereo camera** to obtain the depth, estimating 3D end goal pose

Autonomous Navigation of Bots

Jan'23 - Apr'23

Deployment of various algorithms initially in ROS and then on actual turtlebot Hardware

- Developed algorithm to **autonomously** navigate from a start to goal in an unknown environment using 360° **LiDAR**
- Implemented a **Dijkstra** Algorithm on bot in known environment, graph was constructed by trapezoidal decomposition
- Accomplished **synchronization** & balanced **consensus** among 4 Turtlebots in the unicycle model, ensuring stability

Self Balancing Cube

Aug'21 - Nov'21

Balance a cube on one of its edges using Inertial wheel and by controlling the torque, the cube can be controlled

- Designed an Inertial wheel based cube, balanced it on an edge by PD control using **TIVA** micro controller & MPU6050

TECHNICAL SKILLS & EXTRACURRICULARS

Programming	C++, ROS, Python, MATLAB, Octave, OpenCV, Tensorflow, Keras, PyTorch, HTML, LaTeX, μ C coding
Softwares	SolidWorks, AutoCAD, ANSYS, COMSOL, Mujoco, OpenFOAM, Arduino IDE, MSC Adams, Git, Gazebo
Extracurricular	<ul style="list-style-type: none">• Served as a UG Teaching Assistant for 2 courses Microprocessor and Automatic control and MAC Lab.• Completed 80 hours of Community Service under National Social Service , IIT Bombay

HOBBY PROJECTS

Simultaneous Localization and Mapping of Wheeled bots

Aiming to develop a complete autonomous bot to map and localize in unknown environments

Feb'24 - Present

- Simulating autonomous bots with LiDAR and camera, Implementing mapping algorithms like **FAST SLAM** and **Graph SLAM** in ROS Gazebo. Implemented **ICP** Algorithm for scan matching and **ORB** filter for image feature detection.

Bi Pedal Bot

To control motion of Biped using Reinforcement Learning Methods

Apr'24 - Present

- Formulated a **RL** problem with episodic task with terminal state being when the biped falls, Designed a Biped Bot in **MUJOCO** simulator, Implemented **PPO** algorithm to obtain optimal control strategy to maintain standing position.