

MANTHAN PATEL

SDS-119, MMM Hall of Residence, IIT Kharagpur, West Bengal, India - 721302

+91 9033034268 ◊ manthanhemangpatel@gmail.com ◊ patelmanthan.in ◊ github.com/manthan99

EDUCATION

Indian Institute Of Technology, Kharagpur
B.Tech in Mechanical Engineering

Current CGPA - 9.57/10.00
July 2017 - Present

Ahmedabad International School, Ahmedabad
Higher Secondary Certificate, Gujarat Education Board

June 2014 - April 2017
Percentage: 96.33

RESEARCH INTERESTS

Autonomous Robotics | Control Systems | Planning | SLAM | Exploration Mapping | Micro Aerial Vehicles

RESEARCH PUBLICATIONS

M Patel, A Patnaik, V Mohta, H Shah, S Agrawal, et al. (2019). "Design and Implementation of Path Trackers for Ackermann Drive based Vehicles" In: IFAC Control Engineering Practice (Under Review)

M Patel, et al. (2020). "A Proposal of FPGA-based Low Cost and Power Efficient Autonomous Fruit Harvester" In: IEEE The 6th International Conference on Control, Automation and Robotics, Singapore [\[Publication\]](#)

M Patel, et al. (2019). "A Prototype of an Intelligent Ground Vehicle for constrained environment: Design and Development" In: IEEE International conference on control and robots, South Korea [\[Publication\]](#)

RESEARCH EXPERIENCE/PROJECTS

Autonomous Ground Vehicle Research Group
Planning and Control systems Team

IIT Kharagpur
Feb 2018 - present

• **Guide:- Prof. Debashish Chakravarty, Dept. of Mining Engineering**

- Designed and implemented the controls, planning, localization and electronics module for autonomous mobile robots **Eklavya 6.0** and **Eklavya 7.0** which could autonomously navigate in constrained environments while avoiding obstacles and following GPS waypoints. [\[Report\]](#) [\[Blog\]](#) [\[Video\]](#)
- Designed the planning and control systems module along with the CAN interface for **Mahindra e2o** driverless car. Also worked on sensor setup and integration, drive-by-wire-control and localization of the car. [\[Blog\]](#)
- Designed and implemented control strategies for efficient path tracking of Ackermann steering based vehicles using geometric methods like Stanley, pure-pursuit and **optimal control** methods including **Linear Quadratic Regulator** and **Model Predictive Control** and tested on both simulation and test vehicle. [\[Video\]](#) [\[Blog\]](#)

Advanced Coordination Robotics
Co-Founder

IIT Kharagpur
August 2019 - present

• **Guide:- Prof. Aditya Bandopadhyay, Dept. of Mechanical Engineering**

- The project aims at developing and testing novel algorithms for **exploration** of GPS-denied environments while considering the factors of time-optimality, probabilistic homing and failure recovery.
- Reviewed multiple exploration techniques and implemented the **receding-horizon** based **next-best-view-planner** in simulation. Also implemented Px4 based planning and obstacle avoidance algorithms. [\[Video\]](#)
- Working towards developing multi-agent **planning strategies, map sharing and map-merging** techniques

D.R.D.O. SASE's UAV Fleet Challenge
Mission Strategic algorithm and path planning developer

IIT Roorkee
Oct 2019 - Dec 2019

- As a part of the **8th Inter-IIT Tech Meet**, the problem statement was to deploy automated **UAV - SWARM missions** to scan and search described Targets in given arena in least time. [\[Report\]](#) [\[Presentation\]](#)

- Conceptualized and Implemented efficient and robust **mission planing strategy** and path planning algorithm for the UAV fleet. Developed **Finite State Machine** model and master code for integration of all modules.
- Contributed to the hardware development of four quadrotors, simulated and tested the entire pipeline. [\[Video\]](#)

Inspired Automation Future Technologies

Ahmedabad

Robotics Intern

June 2019 - July 2019

- Built a RACECAR having RGBD camera, 2D Lidar, IMU and encoders while using Jetson Tx2 board for computation. Implemented ROS Hector Slam package to create a 2D map of the environment with the help of laser scan and used particle filters for localising in the pre-mapped environment. [\[Github\]](#) [\[Wiki\]](#) [\[Blog\]](#)
- Worked on vehicle controls as well as on motion planning and navigation using Time Elastic Band planner.
- Designed and implemented algorithms for autonomous drone stabilisation, position hold, localization and navigation in an indoor environment while using beacons and overhead camera for localisation. [\[Video\]](#)[\[Blog\]](#)

Autonomous Agricultural Robot

IIT Bombay

Control Systems and Embedded Team

Nov 2018 - Dec 2018

- Built a low-cost autonomous **Agricultural Robot** to solve the problem statement given by Tata Centre for Technology and Design as a part of the **7th Inter IIT Tech Meet** held at IIT Bombay. [\[Report\]](#) [\[Video\]](#)
- Designed the controller and overall electronic architecture for the 4-DOF Robotic arm. Also implemented kalman filter based localization and path tracking algorithm for accurately following pre-generated path. [\[Blog\]](#)

ACHIEVEMENTS

- Holding an **academic rank 2** among more than 180 students in the Department of Mechanical Engineering.
- Represented Team **Eklavya 7.0** at Oakland University, Michigan for the **27th Intelligent Ground Vehicle Competition(IGVC)** and secured **2nd position** among more than 40 participating international teams.
- Developing a self-driving car for the **Mahindra Rise Prize Driverless Car Challenge**, where the group AGV was among the top **13 teams** in the final round, out of the **400+** that applied for the same.
- Part of the IIT Kharagpur contingent which was the Runners-Up at the 8th Inter-IIT Tech Meet
- Led a team of ten students to develop a prototype of a Semi-Autonomous Fire Fighting Vehicle which was presented in the **Inter-Hall Hardware Modelling** exhibition 2019 at IIT Kharagpur. [\[Report\]](#) [\[Blog\]](#)
- **Winner** of the image processing event **Pixelation** and **Second Runner Up** in **Braitenberg**, a Hardware Hackathon in National Student Space Challenge (NSSC 2018), held at IIT Kharagpur.

POSITIONS OF RESPONSIBILITY

Technology Robotix Society

IIT Kharagpur

Head

March 2019 - Present

- As a driver of the university's official robotics and hobby maker group, responsible for designing and organizing events of Robotix 2020, one of the largest robotics related fest in the country.
- Launched **Makerspace**, an open source robotics lab for student and supervised projects on robotics.
- **IEEE Winter Workshop Mentor**: Mentored a batch of 40 students in a week-long workshop on Autonomous Robotics. Mentored them to solve the problem statement of building a go-to-goal robot.

COURSEWORK

University Courses : Mechanics | Dynamics | Kinematics of Machines | Programming and Data Structures | Machine Learning | Deep Learning** | Probability and Stochastic Processes | Partial Differential Equations

Online Courses : Controls of Mobile Robots (Coursera) | Control Bootcamp | Visual Navigation for Flying Robots | Introduction to Computer Vision

** means ongoing course

TECHNICAL SKILLS

Programming Languages

C, C++, Python, MATLAB

Libraries and Environments

ROS, Gazebo, MavLink, MavROS, Airsim, Git, OpenCV, Numpy

Hardware

Nvidia Jetson TX2/Nano, PixHawk, Ras-Pi, Arduino,

Other Software

Mission Planner, Solidworks, AutoCAD