# Suhrudh. S

Undergradutate · Robotics Enthusiast

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## Education

### BITS Pilani, KK Birla Goa Campus

*Goa, India*

B.E. in Electrical Engineering

*Aug 2019 - Present*

- Major in Electrical and Electronics Engineering
- Minor in Physics
- $CourseWork$: Calculus, Linear Algebra, Probability and Statistics, Differential Equations, Signals and Systems, Communication Systems, Control Systems, Modern Control Systems, Digital Image Processing
- CGPA: $7.6/10$

## Experience

### Black Coffee Robotics

*India*

Robotics Software Intern

*Mar 2022 - Present*

- Built Simulation packages for Multi Robot Systems for industrial sorting robots. Interfaced the simulation packages with ROS/ROS2 and Rviz.
- Designed and developed simulation packages for AMRs in Gazebo, Unity Environments

### Ottonomy Inc.

*India*

Robotics Intern

*Sep 2021 - Dec 2021*

- Built a package for Simulation of Robot in 3D Urban environment with ramps, walls etc. in Gazebo Simulator
- Looked into integration of move-base-plugin for 3D Environments using packages like Spatio-Temporal-Voxel-Layer, Voxblox, Octomap.
- Analysed volumetirc mapping and the usage of Voxblox for Path Planning in 3D
- Compared planners like BIT*, AIT*, RABIT* for efficiently planning a path in 3D environments.
- Developed of a 3D Path Planning algorithm using Multi Heuristic Search A-Star with custom heuristics apt to Urban Navigation

### Peppermint Robots

*India*

Robotics Intern

*May 2021 - Jul 2021*

- Built a GUI based on Qt Quick and QML
- Integrated the GUI with ROS2 and tested it out on the Robot
- Researched about State Lattice Based Path Planning for Indoor Robot and analysed better ways to perform local planning using incremental Graph Search Techniques
- Developed a Motion Primitives based local planner and implemented a move-base-flex plugin for the same

## Research

### State Estimation for Autonomous UAV

*Bits Goa*

Undergraduate Research

*Sept 2021 - Dec 2021*

- Conducted research under Prof. Rakesh Warier on State Estimation Techniques for transitions between Indoor and Outdoor Autonomous flight.
- Learnt and compare different paradigms of State Estimation, i.e., Filtering, Fixed-lag smoothing etc.
- Analysed Optimisation based methods with tightly coupled VIO measurements.

## Projects

### Indoor Autonomous Drone

*GOA*

Personal

*July 2020 - Dec 2020*

- Worked on the navigation stack of an Indoor Aerial Robot
- During the project, I learned more about agile Autonomous drones, Path planning in complex 3D environments and trajectory optimisation.
- Used ROS and several Open Source packages to develop a Navigation stack for Indoor Autonomous Drone and tested it out using RotorS Simulation
- Wrote an $article$ explaining the project

### Trotbot

*BITS, Goa*

Club

*Jan 2020 - PRESENT*

- I am leading the team on building an indoor autonomous Robot capable of traversing in indoor environments. The robot can travel omnidirectionally is called $Trotbot$
- Researched and implemented State Estimation algorithms in Indoor Environments using LiDAR, IMU and Wheel Encoders
- Lead and advised the team on using Deep learning algorithms for Semantic Scene understanding

### Gennav

*BITS Goa*

Contributor

*Jun. 2020 - Dec. 2020*

- Contributed to building a modular python package for autonomous navigation algorithms.
- Worked on integrating the algorithms to ROS using a wrapper, gennav ROS

### Drone Mapping of Mangrove Swamps in Goa

*Goa*

Member

*Sep. 2021 - Dec. 2021*

- Under the guidance of Prof. Shibu Clement funded by the Forest Department of Goa, 3D Map 44 sq. km of Mangrove Swamps in and around Goa using a DJI Phantom 4 Pro V2.
- Built a Ensemble model for Identification of 16 different Mangrove Species using Resnet18 and VGG (acc 86% and f1-score 0.86)
- Built a Desktop application using Tkinter to run the inference of the Model built.
- Worked on stitching images together and using Image Processing techniques to obtain boundaries of each Mangrove

## Extracurricular Activity

### Center for Technical Education

*BITS, Goa*

President

*May 2021 - PRESENT*

- I lead a motivated team of 30+ students from different backgrounds and collectively we work in the largest Technical Organisation in BITS Goa, Campus with the sole aim of improving the Technical Culture of Campus
- We collaborate with all the technical clubs of campus and host many events together. We host industry professionals to talk about their fields of expertise etc.
- We conduct courses, workshops, Hackathons, provide Project Funding to prospective projects on campus
- In my previous years as a Core Member, I improved systems of Automation in areas of Emailing, Certificate Generation etc.
- I also worked as the Lead for Academic Assistance Program, where we aim to help out Juniors in academics by organising informal peer-to-peer discussion sessions and study groups.

### Project Kratos

*BITS, Goa*

Member

*Aug 2020 - August 2021*

- Project Kratos is student run team which aims to participate in the Univesity Rover Challenge
- I was part of the Autonomous subsystem. I contributed to the navigation pipeline of the Rover an implemented obstacle avoidance.

## Teaching

### Software for Embedded Systems

*BITS Goa*

FDCM

*Jan 2022 - May 2022*

- I was a First Degree Teaching Assistant for a Master's course on Software for Embedded Systems by the Dept. of CSIS, BITS Goa.
- Conducted lab sessions on Python Programming, Arduino Programming and Robot Operating System.
- Designed and Evaluated final course Projects and helped in conducting various evaluative components throughout the course.

### Introduction to Aerodynamics and Aerial Robotics

*BITS Goa*

Instructor, CTE

*Jan 2021 - May 2021*

- I was an instructor for the course and designed Course Material on Aerial Robotics
- Taught introduction to Path Planning, Perception and State Estimation

### Robot Automation using ROS

*BITS Goa*

Mentor, QSTP

*Summer 2021*

- Taught and provided resources for the basics of Robotics with the Introduction of Robot Operating System, Control and basics of Path Planning

### Aerial Robotics

*BITS Goa*

Mentor, QSTP

*Summer 2021*

- Taught Path Planning and State Estimation for Drones.
- Provided material for Path Planning in 2D and 3D environments, G-H Filter, Kalman Filters in 2D and 3D

## Tech-Stack

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|---|---|
| **Tools** | Robot Operating System, Arduino Programming, Pytorch, Tensorflow, Simulink, Fusion 360, Eagle |
| **Programming** | Python, C/C++, MATLAB, RUST, LaTeX |
| **Languages** | English, Telugu, Hindi, Tamil |

## Clubs and Departments

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|---|---|---|
| 2020 | **AAP Head**, Center for Technical Education | *BITS, Goa* |
| 2020 | **Senior Core Member**, Electronics and Robotics Club | *BITS, Goa* |
| 2020 | **Senior Core Member**, Aerodynamics Club | *BITS, Goa* |
| 2020 | **Core Member**, Project Kratos | *BITS, Goa* |