

Siddharth Bhurat

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EDUCATION

University of Michigan, Ann Arbor, MI

Master of Science in Robotics (GPA 4/4)

August 2022 – April 2024

Graduate student Instructor for Robotic Systems Laboratory (ROB550)

Maharashtra Institute of Technology, World Peace University

Bachelor of Technology in Robotics and Automation (CGPA 9.61/10)

May 2022

SUMMARY

Dynamic Robotics Engineer with a proven track record in designing and implementing innovative solutions. Proficient in developing robotic systems, leveraging expertise in robotic arms, AGV, AMR using sensor fusion, control systems, machine learning, and computer vision to drive advancements in smart manufacturing systems and autonomous technologies.

TECHNICAL SKILLS

Programming languages: Python, C, C++, Ladder Logic

Framework/ Libraries: Robot Operating System (ROS1 & ROS2), Pytorch, OpenCV, scikit-learn

Version Control: Git, Docker

Operating systems: Windows, Linux

Microprocessors and Microcontrollers: Raspberrypi, JetsonNano, tinkerbord, NodeMCU (UART, USART, I2C, SPI, MQTT, CAN)

Software & Manufacturing: MATLAB, Gazebo Simulator, RViz, Robo-analyzer- Robot Kinematics, 3D – Printing, Fusion360

Key Skills: Computer Vision(RGBD), Controls, Deep Learning, Pose Estimation, ADAS

PROFESSIONAL EXPERIENCE

Milwaukee Electric Tool Corporation, Brookfield, Wisconsin

May 2023 – August 2023

Robotics Engineering Intern – Autonomous Lawn Mower (Manual -> Fully Autonomous)

- Formulated a precise localization algorithm by interfacing sensors such as camera, RTKGPS, Lidar, IMU and wheel encoders, achieved $\pm 3\text{cm}$ accuracy; incorporated udev rules for USB communication; used invariant extended Kalman filter
- Interfaced motors via ROS, implementing a differential drive controller for autonomous navigation
- Engineered a "pure pursuit" closed-loop line following controller with arc following
- Developed a robust mapping algorithm with frontier detection for autonomous exploration using C++

Barton Research Group @ University of Michigan

January 2023 – April 2023

Research Assistant - Heterogenous Multi Robot Integration for End to End Automation in Manufacturing

- Deployed diverse robots (Toyota HSR, Kuka Kmr, Kawasaki Duaro) with a unified master controller, enabling shared sensing & seamless integration via ROS over WiFi; implemented SLAM, exploration for mapping & A* algorithm using C++

Itech Robotics and Automation pvt Ltd., Pune, India

October 2021 – February 2022

Intern | Autonomous Mobile Robot Developer

- Added an extra axis to robotic arm and integrated with PLC controller to be used with teach pendant using structured text
- Wrote a new driver for ft servo motors to work with ROS for autonomous mobile robot development
- Implemented g-mapping, monte-carlo localization and used move-base navigation framework with ROS for SLAM
- Utilized lidar with Jetson Nano to map the surrounding and Fused sensor data from imu and encoders for odometry

lotiot (lotiot.in), Pune, India

June 2019 – November 2020

Intern | Embedded Developer and Computer Vision Developer

- Developed C++ libraries for soil moisture, temperature sensors and stereo cameras, integrated with their operating system
- Led a team, developing a computer vision application to detect patient motion, triggering urgent medical aid signals

PROJECT EXPERIENCE

Model Predictive Control Based Path Following and Obstacle Avoidance for a Drone

August 2023 – December 2023

- Modeled the drone dynamics in MATLAB using Newton's equations of motion
- Formulated a constrained nonlinear optimization problem considering shortest path and obstacle avoidance
- Implemented nonlinear model predictive control for the defined problem using MATLAB & compared with PID controller

Distributed Control, Scheduling and Planning of Multi Robot System

August 2023 – December 2023

- Researched on converting a centralized multi robot control and scheduling into a distributed system where all the different robot capabilities intermittently/continuously communicate with each other & gain information from each other
- This type of system which is distributed will help in reducing the communication requirements compared to central system

ArmLab | Robotics Arm

August 2022 – October 2022

- Employed the Interbotix Robotic (6 DOF) Arm to create a pick and place application using a depth camera
- Computed DH parameters and executed forward and inverse kinematics using Python alongside ROS
- Devised a block detection algorithm by segmenting blocks using computer vision techniques and calculating their coordinates in the real world using camera intrinsic and extrinsic matrices for pick and place and stacking operations