Shashwat Mudugur Ashok Kumar

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Education

Purdue University — West Lafayette, IN, USA
Master of Science in Autonomy and Robotics — *Aug. 2024 – (Dec. 2025)*
Relevant Coursework: Robotics, Autonomous Systems, Artificial Intelligence
Cumulative GPA: 3.77/4.0

Manipal Academy of Higher Education — Manipal, Karnataka, India
Bachelor of Technology in Mechatronics, Minor in Electric Vehicle Technology — *Oct. 2020 – May 2024*
Cumulative GPA: 8.54/10.0

Skills & Interests

Technical Skills: ROS2, NAV2, MicroROS, OpenCV, PyTorch, Keras, Git, CAD, 3D Printing, PLC Programming.

Programming Languages: C, C++, Python, Embedded C and RTOS, Bare-Metal Firmware, MATLAB and Simulink.

Work Experience

Robotics Firmware Engineering Intern — May 2024 – July 2024
Algobotix — *Bangalore, Karnataka, India*
- Redesigned the payload system for autonomous drone navigation using CAD and 3D printing, integrating Raspberry Pi, IMU and battery
- Implemented MAVLink protocol with C++ and STM32 for communication and control of drone and payload
- Developed a C++ ROS2 node that integrated PX4 flight controller using XRCE-DDS protocol to visualize the drone's position and orientation in real-time GitHub

Embedded Research Intern - Bachelor's Thesis — Jan 2024 – May 2024
Robert Bosch Center for Cyber-Physical Systems, Indian Institute of Science(IISc) — *Bangalore, Karnataka, India*
- Designed and developed a drone flight controller using ESP32 integrated with Micro-ROS for interfacing with a Motion Capture System, programmed in C and C++ using ESP-IDF GitHub
- Implemented RTOS-based scheduler to acquire Motion Capture System data and activate fail-safe mechanisms during communication loss
- Integrated MPU-6050 (via I2C) and Lidar (via UART) to enable autonomous safe landing under fail-safe conditions
- Devised a Prescribed Performance Control (PPC) algorithm for DC motor speed control using a Teensy microcontroller, achieving 30% better stability compared to PID control GitHub

Systems Engineering Intern — June 2023 – Aug 2023
Ola Electric — *Bangalore, Karnataka, India*
- Introduced supercapacitors into vehicle models to enhance regenerative braking performance and simulated the system using Gamma Technology Software, resulting in a 23% increase in vehicle range
- Designed a flight controller with PID control and MPU-6050 integration via I2C for precise drone stabilization and control

Electronics and Powertrain Engineer / Team Leader — Nov 2020 – May 2023
Moto Manipal – Electric Superbike Team — *Manipal, Karnataka, India*
- Designed the wiring harness of an electric superbike powered by 10kw PMSM Motor. Worked on calculation, design, and manufacturing the Li-ion battery pack also worked on MATLAB and Simulink for powertrain modeling and range calculations
- Developed an interactive dashboard using Python and RaspberryPi3 and collected data from the motor controller using CAN (Controller Area Network) communication along with data logging system for monitoring and analysis through ESP32 controller GitHub

Research Experience and Projects

Smart Temperature Control for Hydroponics — Embedded C, C++, RTOS
- Integrated an STM32 microcontroller, DS18B20 temperature sensor via 1-Wire protocol, and relay-controlled fan to implement a closed-loop system for maintaining the temperature of a hydroponics system

Traffic Sign Classification using Cross Stage Partial Network GitHub — PyTorch, Python, Open CV , Matplotlib
- Developed a traffic sign classification model using CSPNet to boost computational efficiency and gradient flow by 20%
- Implemented Mish activation function to enhance gradient propagation and improve model performance
- Applied data augmentation techniques to improve generalization, achieving 87% accuracy on the German Traffic Sign Dataset

RRT* Path Planning and Following for Obstacle Avoidance on TurtleBot3 GitHub — Python, ROS2, Rviz, Gazebo, Matplotlib
- Implemented RRT* algorithm for path planning and graph construction using KD-Tree; implemented path generation and tracking using a PID controller with simulations in RViz and Gazebo environments

A* Path Planning with PID Control on TurtleBot4 and Simulation on TurtleBot3 GitHub — Python, ROS2, Rviz, Gazebo, Matplotlib
- Developed and tested an A* path planning algorithm with PID control on TurtleBot4, achieving optimized navigation and trajectory following with obstacle avoidance.

Leadership & Activities

Team Leader at MotoManipal: Emerged victorious in Electric Bike Design Challenge organized by Mechatron Motors. Secured third place in National Online E-Bike Design Challenge hosted by the Fraternity of Mechanical and Automotive Engineers.

Captain and Team Member of Karnataka State Basketball Team: Participated in the U-16 and U-19 National tournaments.