

# Vadivelan Murugesan

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## SUMMARY

Robotics Engineer with hands-on experience in embedded systems, motion planning, and perception. Skilled in C++, Python, ROS, and microcontroller-level development with STM32 and ODrive. Comfortable working across hardware, firmware, and simulation to build deployable robotic systems. Experienced with a wide range of sensors—including IMUs, depth cameras, and optical cameras—and in controlling both mobile bases and articulated robotic arms.

## SKILLS

**Programming:** Python, C, C++, Lua

**Robotics & Control:** ROS, MoveIt, Control Systems, Kinematics, Teleoperation

**Embedded Systems:** Arduino, Raspberry Pi, Parallax Propeller, STM32, ODrive, CAN, SPI, I2C, Embedded C/C++, PCB Debugging, Soldering

**Perception & CV:** OpenCV, ArUco, YOLOv8, ICP, RANSAC

**Simulation Tools:** Gazebo, CoppeliaSim, MATLAB, Simulink

**Sensors & Actuators:** IMU, Depth Camera, Optical Camera, Ultrasonic, Color Sensor, Potentiometers, Servo/BLDC Motors

## WORK EXPERIENCE

### Surinova Pvt Ltd

Robotics Engineer

Chennai, India

11/2022 – 07/2023

- Collaborated on the development of a tea-harvesting rover by integrating ODrive motor controllers with STM32F4 microcontrollers and custom PCB hardware, utilizing CAN, SPI, and I2C protocols for real-time communication and control.
- Proficient in Python and C/C++, applied these languages in developing and debugging embedded firmware.
- Utilized advanced testing tools like Picoscope for debugging microcontroller-based projects, resulting in a 50% decrease in troubleshooting time and increased project turnaround efficiency.

### Cologenes Healthcare Pvt Ltd

Technical Intern

Salem, India

06/2021 - 08/2021

- Devised an automated segment of collagen sheet production utilizing a laser cutter, reducing processing time by 30% and increasing overall efficiency through optimized computing processes.
- Implemented computer vision techniques to ensure precise automation of collagen sheet production, improving alignment accuracy by 80% and enhancing production throughput by 20%.

## PROJECTS

### Proactive Human-Manipulator Collision Avoidance ([Github Link](#))

2025

- Built a Digital Twin environment in Gazebo to simulate and test safe robot behavior in dynamic, human-populated settings.
- Utilized RGB-D camera for real-time 3D human pose estimation to predict future possible human pose.
- Integrated ROS 2, MoveIt, and UR16e for real-time control and adaptive robotic motion in human-aware tasks.
- Employed A-RRT\* algorithm for efficient, dynamic path planning, enabling the robot to replan motion trajectories safely in response to predicted human movements.

### Key Projects in Perception, Machine Learning, and 3D Mapping ([Github Link](#))

2024

- Developed custom algorithms for RANSAC Plane Fitting and Iterative Closest Point (ICP) to process and align 3D point clouds, achieving precise plane fitting and point cloud registration.
- Created Augmented Reality visualizations using OpenCV and Aruco markers, projecting 3D objects onto real-world tags with precise calibration and rendering techniques.
- Implemented object tracking in dynamic video sequences using YOLOv8 and tracking algorithms, ensuring robust and persistent identification across frames.

### Automated Object Retrieval Mobile Robot ([Github Link](#))

2024

- Developed an automated mobile robot system with integrated camera and Raspberry Pi for real-time object identification using OpenCV. Designed perception algorithms for object detection and localization.
- Engineered and programmed a mobile robot with a 2-DOF arm, achieving manipulation capabilities to autonomously navigate and relocate objects within an arena, demonstrating advanced control and planning capabilities in dynamic environments.

### Color Cube Sorting Robotic Arm ([Github Link](#))

2024

- Engineered a 4-DOF robotic arm with a gripper to sort color cubes on a conveyor belt, integrating a color sensor for real-time identification and an ultrasonic sensor for detecting cube proximity.
- Enhanced the automation process by utilising cogs in Parallax Propeller Board, implementing multiprocessing that enables simultaneous colour and distance sensing, improving the efficiency and accuracy of the sorting mechanism.

### Teleoperation of a 4-DOF Robotic Arm ([Github Link](#))

2024

- Built a real-time teleoperation system with near-instantaneous response using analog sensor feedback; enabled dynamic IK-style mirroring and pre-programmed motion cycling for intuitive control.
- Implemented a system allowing the robot to save and cycle through up to 10 reprogrammable positions, enhancing operational flexibility.
- Developed a real-time mirror mode that replicates the puppet robot's orientation, demonstrating advanced real-time control capabilities.

## EDUCATION

New York University

M.S. Mechatronics and Robotics

New York, USA

2025