VISVAJIIT CHEZHIAN *M.S Robotics*

✉ visvajiit23@gmail.com   in Visvajiit Chezhian   🔗 Portfolio

Budding roboticist with extensive research experience in Localization and Trajectory Planning. Highly enthusiastic about advancing cutting-edge research in mobile robotics

EDUCATION

Bachelor of Technology in Mechanical Engineering, *Manipal Institute of Technology*
Jul 2018 – Oct 2022 | Manipal, India
CGPA: 8.48/10 (Minor specialization: Fundamentals of Computing)

PUBLICATIONS

V. Chezhian and S. Rao, "**A Vectorial Approach to Particle Filter Weighting and Resampling for Robot Localization**," *2025 25th International Conference on Control, Automation and Systems (ICCAS)*, Incheon, Korea, Republic of, 2025, pp. 1457-1462, **DOI: 10.23919/ICCAS66577.2025.11301265.** 🔗

Visvajiit Chezhian and Sachit Rao, *Zero-Clamped C2-Continuous Jerk Minimized Quintic Time trajectories* (in preparation)

RESEARCH EXPERIENCE

Research Associate, *Advisor: Prof. Sachit Rao*
Oct 2022 – Jul 2025
Ascend Studio, Machine Intelligence and Robotics Center (MINRO)
International Institute of Information Technology, Bangalore(IIITB)

Zero-clamped C2-continuous Quintic Jerk-Minimized Time Trajectories
Jul 2024 – Sep 2025
- Implemented a path smoothing algorithm using quintic time trajectories to achieve **C2 continuous global trajectories** for a self-navigating ground robot.
- Developed **quintic blending** for seamless transitions between linear path segments generated by *Orientation Aware A* algorithm*.
- Formulated an **analytical solution** that simultaneously bounds **blend times** and enforces **convex-hull-constrained** trajectories, replacing traditional iterative feasibility and collision-detection procedures.
- Investigating optimal start/end point selection for **jerk-minimized blending** to improve trajectory smoothness and dynamic performance.

Vectorial approach to Particle Filter weighting
Jan 2024 – Jun 2024
- Developed a novel vector-based weighting method for particle filters, improving robustness to outliers and symmetric map ambiguities in global localization.
- Achieved more successful global localization by replacing the standard sensor model implementation with proposed method in localization pipelines.
- Authored a first-author research paper on this approach, accepted for publication at ICCAS 2025.

Cross-Sensor Point Cloud Registration
Oct 2023 – Dec 2023
- Implemented cross-sensor point cloud matching using ArUco markers, integrating camera and depth sensor data.

- Developed a robust method for **detecting** and estimating the pose of ArUco markers with up to **90% accuracy** on viewing angles less than 45 degrees, enhancing the precision of 3D mapping.
- Achieved seamless point cloud alignment, improving the efficiency and accuracy of multi-sensor fusion in complex environments.

Multi-agent path planning using HCA*   Sep 2023 – Sep 2023
- Implemented Hierarchical Cooperative A* (HCA*) for a warehouse management-oriented startup.
- Generated collision-free multi-agent trajectories, optimizing the efficiency and safety of warehouse operations.

Orientation aware modified A* algorithm   Jul 2023 – Aug 2023
- Developed an orientation-aware A* algorithm respecting non-holonomic constraints of ground robots.
- Optimized the search space by biasing easier motions, narrowing down to more likely waypoints and **reducing the number of steps** to reach the goal by **up to 50%** .
- Implemented a method to **prevent sharp turns**, aiding higher curvature blends.
- Achieved faster cornering as a result of the implemented method.

Localization and Autonomous Navigation   Jan 2023 – May 2023
- Achieved real-time global localization using **particle filter** with mean error of 10 cm and 0.4 rad in a 13x15 meter room on all successful attempts using MATLAB.
- Implemented the **A*** algorithm for path planning.
- Applied piecewise-stitched cubic time trajectories using obtained waypoints, ensuring **global velocity continuity** and piecewise acceleration continuity.

Rhythmic flight with Quadcopter   Oct 2022 – Dec 2022
- Achieved music-synchronised quadcopter movement in a confined three-dimensional space using MATLAB.
- Utilized **Fast Fourier Transform** to identify prominent frequencies and track their intensity changes over the piece of music.
- Identified patterns in varying intensities over multiple octaves to determine the time to traverse segments.
- Applied 1-dimensional cubic time trajectories to ensure smooth velocity profiles.

PROJECTS

SLAM and Autonomous Navigation on Mobile   Feb 2022 – Sep 2022
Robot using ROS 1
Advisor: Prof. Sivayazi Kappagantula, MIT Manipal
- Designed, 3D printed and assembled a mobile robot.
- Used LiDAR as sensor input and wheel encoder data for odometry input.
- Utilized ROS1 Gmapping and Navigation Stack for peripheral integration, SLAM implementation and autonomous navigation.

Turtlebot3 Simulation in Gazebo   Nov 2021 – Dec 2021
- Constructed a custom world using Gazebo in ROS1.
- Implemented Gmapping package on Turtlebot3 model to perform slam on Gazebo simulation.

Vending Machine for MIT Manipal Innovation Centre   May 2019 – Jul 2019

- Collaborated with seniors in developing the dispensing mechanism of an inhouse vending machine.
- Installed an IR-based system to ensure failproof transactions, enhancing the overall reliability.

ROLES OF RESPONSIBILITIES

- Held the position of **Class-Representative** for three academic years (2019-2022).
- **Point of Contact** for **Outreach efforts** of Ascend Studios, IIIT Bangalore.

OUTREACH AND WORKSHOPS

ROS Workshop : Conducted a week-long workshop on setting up a ROS environment and various simulations for faculty members of the Myanmar Institute of Information Technology.

STEM Outreach : Conducted over 15 lab demonstrations showcasing drone shows and 6-DOF manipulator operations, simplifying complex algorithms for undergraduate and school students.

Poster Presentation : Presented a poster titled "Localization and Navigation methods" at the annual RISE event at IIIT Bangalore, showcasing innovative research and developments.

SKILLS

Programming	**Softwares and Tools**	**Sensors and Hardware**
Matlab, Python, Bash	ROS 1, Gazebo, Fusion360	LiDAR, Kinect, Encoders

ADDITIONAL COURSES

Artificial Intelligence for Robotics, *Udacity offered by Georgia Institute of Technology*

Modern Robotics, Course 2: Robot Kinematics,
Coursera offered by Northwestern University 🔗

Modern Robotics, Course 1 : Foundations of Robot Motion,
Coursera offered by Northwestern University 🔗