

Demonstration of Autonomous Vehicle in unknown environment using SLAM for an Omni-directional robot.

Abstract

Autonomous mobile robots are used in industrial, research, and service applications to perform tasks with minimal human intervention. Omnidirectional mobile robots offer excellent maneuverability, enabling smooth motion in any direction without changing their orientation, making them suitable for navigation in confined and complex environments.

This project focuses on enhancing an existing wirelessly controlled omnidirectional robotic vehicle and extending its capabilities towards autonomous navigation. The existing robot is built using an ESP32 microcontroller and four omni wheels, enabling smooth motion in all directions through a smartphone-based wireless interface. As part of this project, the robot will be upgraded by integrating suitable sensors, such as LiDAR, ultrasonic sensors, and other feedback devices, to enable environmental perception and safe operation. The student will implement Simultaneous Localization and Mapping (SLAM) to generate a map of an unknown indoor environment while estimating the robot's position in real time. Based on the generated map, localization, path-planning, and obstacle-avoidance algorithms, such as A*, Dijkstra, or other suitable methods, will be implemented to enable autonomous navigation to desired target locations. The developed system will be validated through simulation and demonstrated on the existing omnidirectional robot.

The project will provide hands-on experience in mobile robotics, sensor integration, localization, mapping, autonomous navigation, and the Robot Operating System (ROS/ROS 2).

Academic Project Requirements:

1) Required No. of student(s) for academic project: 1

2) Name of course with branch/discipline: M.E./M.Tech Electronics and Instrumentation Engineering

3) Academic Project duration:

(a) Total academic project duration: 38 Weeks

(b) Student's presence at IPR for academic project work: 4 Full working Days per week

Email to: jonnada.jayaram@ipr.res.in[Guide's e-mail address] and project_ece@ipr.res.in [Academic Project Coordinator's e-mail address]

Phone Number: 079 -4438 [Guide's phone number]