iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** V **Month of publication:** May 2026

DOI: https://doi.org/10.22214/ijraset.2026.82122

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue V May 2026- Available at www.ijraset.com

Design & Development of Delivery & Greeting Robot for College Campus

Dr. V. Nanammal[1], Sancia Rosary A[2], Sarshini E[3], Yamini J[4]
[1]*Assistant professor, ECE, Jeppiaar Engineering College, Anna University, Chennai, Tamil Nadu, India*
[2, 3, 4]*Department of Electronics and Communication Engineering, Jeppiaar Engineering College, Anna University, Chennai, Tamil Nadu, India*

Abstract: ***Autonomous service robots are becoming increasingly useful in smart campuses and modern institutions. This project presents the design and implementation of a GPS-based delivery and greeting robot capable of operating in both automatic and manual modes. The robot is controlled using an ESP32 microcontroller and powered by an inbuilt rechargeable battery with a charging circuit. A GPS module is used for navigation within the campus environment. Ultrasonic sensors help the robot detect and avoid obstacles during movement, ensuring safe navigation. An IR sensor is used to detect the presence of delivery items inside the robot's storage compartment. The robot uses an L298 motor driver and gear motors for movement control, while an I2C LCD display provides system status and greeting messages for users. In automatic mode, the robot navigates to predefined locations for delivery, while in manual mode it can be controlled remotely. This system improves automation, reduces human effort, and enhances smart campus services.***

Keywords: Autonomous Delivery Robot, ESP32 Microcontroller, Global Positioning System, Navigation Obstacle Avoidance, Ultrasonic Sensor, L298 Motor Driver, Embedded Systems, Mobile Robotics Autonomous Navigation

I. INTRODUCTION

The project titled "Design and Development of a Delivery and Greeting Robot for College Campus" presents an innovative approach to automating delivery services within a campus environment. The system is centred around an ESP32 microcontroller, which acts as the brain of the robot by coordinating communication, control, and data processing. A GPS module is used to enable navigation to predefined locations across the campus, allowing the robot to perform autonomous delivery tasks efficiently. Additionally, the robot supports both automatic and manual modes, providing flexibility for different operational requirements. The robot is equipped with multiple sensors to ensure safe and reliable operation. Ultrasonic sensors are used for obstacle detection and avoidance, allowing the robot to move smoothly without collisions. An IR sensor is integrated to detect the presence of items inside the delivery compartment, ensuring secure package handling. The movement of the robot is controlled using gear motors driven by an L298 motor driver, which provides precise control over direction and speed. The system is powered by an inbuilt rechargeable battery along with a charging circuit, enabling continuous and energy- efficient operation.

II. MATERIALS AND METHODS

A. Hardware Components (Materials)

The proposed delivery and greeting robot were developed using:

- ESP32 microcontroller as the main controller
- Global Positioning System module for navigation
- Ultrasonic sensor for obstacle detection

B. System design and integration

The robot was designed by integrating navigation, sensing, motor control, and display modules into a single embedded system.

- ESP32 processes sensor inputs and controls robot operations.
- GPS guides the robot to predefined campus locations.
- Ultrasonic sensors detect obstacles and help avoid collisions.

C. Software and Control Method

The robot was programmed using Arduino IDE with Embedded C.

©IJRASET: All Rights are Reserved

Method followed:

- Initialize sensors and controller
- Read GPS coordinates for navigation
- Detect obstacles and perform avoidance

D. Testing and Performance Evaluation

The developed robot was tested under campus- like conditions for:

- Navigation accuracy
- Obstacle avoidance performance
- Package detection reliability

The system showed effective delivery operation, safe movement, and proper coordination among hardware and software modules.

III. RESULTS

Operation	Time(sec)
Average Obstacle Response Time	2-3 sec
Package Detection Time	1 sec
Navigation Setup Time	8 sec
Delivery Completion Time	20 sec
Object Recognition Accuracy Time	1.5 sec

Table I: Comparison Of Navigation Time Using Traditional Method And Operation

Average Time

- Traditional Time: 115 sec
- Proposed Delivery Time: 40 sec

The system reduced navigation time by approximately 65.2%.

IV. DISCUSSION

Obstacle detection tests showed reliable response within **2–3 seconds**, improving safety during robot movement. The IR sensor successfully confirmed package presence, increasing delivery reliability. The dual-mode operation (automatic and manual) improved flexibility and usability.

Compared with traditional methods, the proposed system offers:

1) Reduced delivery time
2) Lower human intervention
3) Improved delivery accuracy
4) Safe navigation through obstacles
5) Better user interaction through greeting and status display

V. CONCLUSION

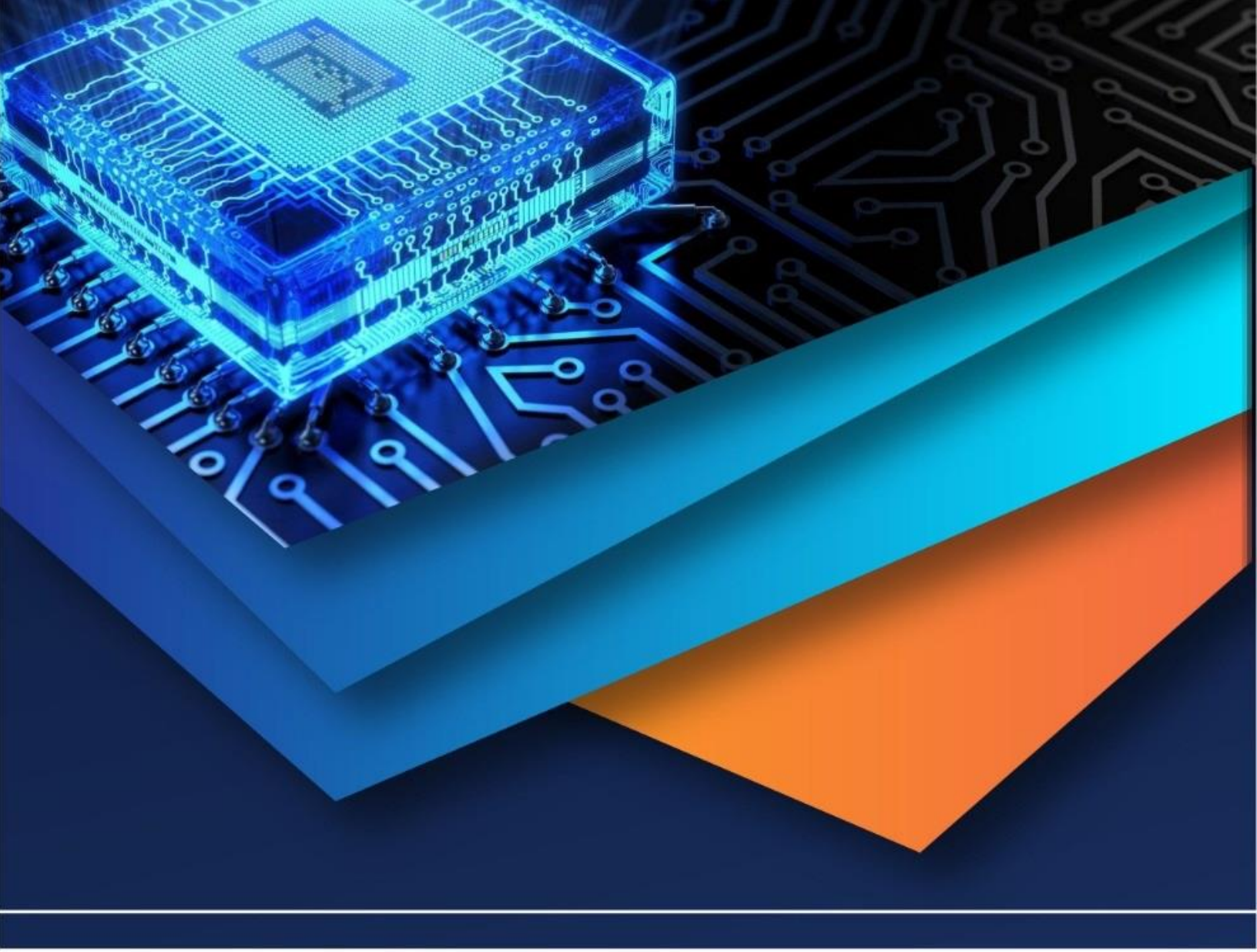
The “Design and Development of a Delivery and Greeting Robot for College Campus” project successfully demonstrates the implementation of an intelligent and autonomous system for campus delivery applications. The robot effectively integrates GPS navigation, sensor-based obstacle avoidance, and dual-mode operation to perform delivery tasks with minimal human intervention. The use of the ESP32 microcontroller ensures efficient control and coordination of all system components, resulting in smooth and reliable performance.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

REFERENCES

[1] Kim, T., Kang, G., Lee, D., & Shim, D. H. (2024). Development of an Indoor Delivery Mobile Robot for a Multi-Floor Environment. IEEE Access, 12, 11234–11248.
[2] Gujarati, A., Kulkarni, A., Patil, U., & Joshi,
[3] S. (2021). Design and Development of Autonomous Delivery Robot. International Journal of Engineering Research & Technology (IJERT), 10(6).
[4] Li, J., Wang, Z., Yang, W., & Zhang, H. (2022). Autonomous Mapping and Path Planning of Indoor Delivery Robot Based on ROS. Journal of Artificial Intelligence Practice, 5(2), 45–53.
[5] Kannan, S. S., Lee, A., & Min, B. C. (2021).
[6] Human–Robot Interaction for Delivery Robots: Expression of Navigation Intent. Robotics and Autonomous Systems (Elsevier), 140, 103746.
[7] Liu, M., Chen, M., Wu, Z., & Zhang, Y. (2024). Design of Intelligent Service Robot Based on ROS and Deep Learning. Sensors (MDPI), 24(3), 1021.
[8] Chen, X., Liu, Y., & Wang, H. (2023).
[9] Design and Implementation of a Smart Campus Delivery Robot System. 30 Springer Journal of Ambient Intelligence and Humanized Computing, 14, 889–902.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)