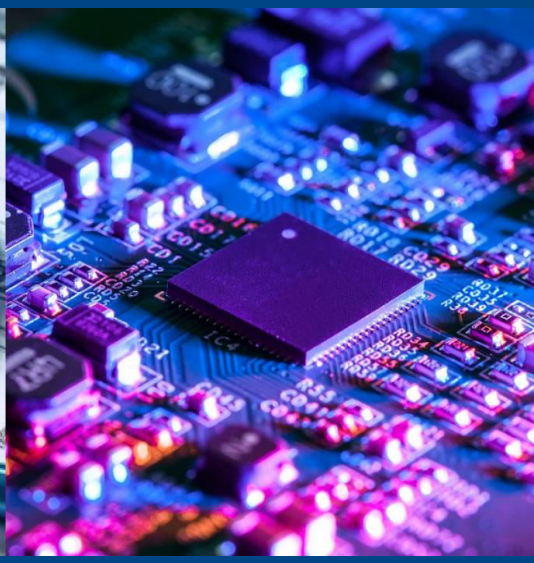
ISSN: 2582-7219





International Journal of Multidisciplinary Research in Science, Engineering and Technology

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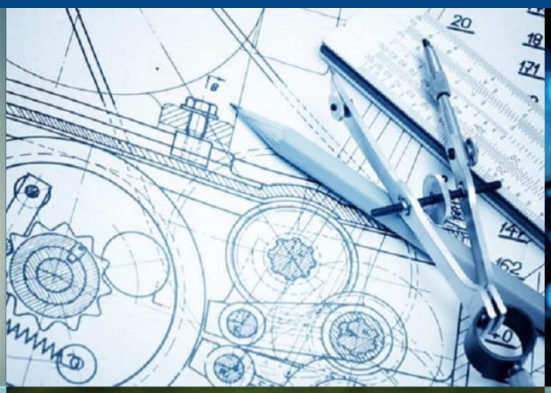

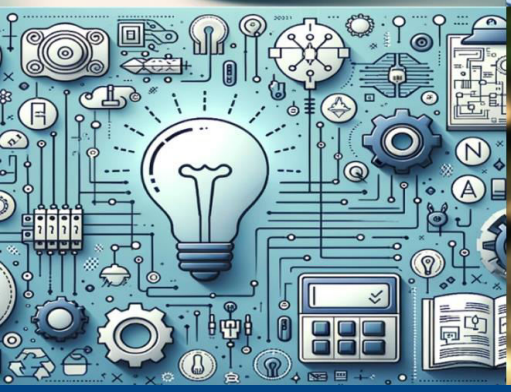

Impact Factor: 8.206 **Volume 8, Issue 4, April 2025**

© 2025 IJMRSET | Volume 8, Issue 4, April 2025 |DOI:10.15680/IJMRSET.2025.0804492

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Spring less Car Suspension using Bevel Gears

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ABSTRACT: This research focuses on an intelligent mobile garbage collection robot that uses visual recognition technology to perform path planning, traverse designated areas, and identify and collect recyclable waste. The system includes a navigation module, a target detection module, and a sorting control module. The navigation module operates on the ROS distributed framework, leveraging lidar to gather environmental data of the defined area and implementing SLAM using a scan-matching algorithm. It perfonus path planning through an optimal routing algorithm to cover the chosen area thoroughly. During the robot's traversal, the target detection module utilizes the MobileNetv3-SSD deep learning algorithm to identify and classify objects in images captured by the camera. This module extracts the target's coordinates and orientation, enabling the manipulator to execute waste collection tasks accurately.

KEY WORDS: Sensors, Microcontroller, Batteries, Camera, DC Motors. Ab

I. INTRODUCTION

In today's era as we know that where countries are developing at a rapid rate a lot of unwanted waste is being generated like electronics, plastics and many biodegradable products. Waste management being the utmost spurned factors in developing countries creates an urgency to address this problem. In metropolitan or city areas, the clearance of waste management has been a grind task for the majority of the country all over the world and also the lacking for gathering information is a major challenging task. Improper waste disposal can seriously affect the health of people living in contaminated areas or near landfills. A healthy environment is necessary to stay healthy and live healthy. Hence we made an autonomous robot that detects and follows a line. The path may be visible like a black line on a white surface or vice versa and at the same time we can monitor the garbage level present in the bin. The Main Motivation for the proposed system is at present, manual methods are majorly used for cleaning. Although garbage removal is a good source of manual labor, there are still some problems associated with manual garbage removal, such as excessive land pollution/garbage and the inability to provide sufficient labor in all cases. When it comes to eliminating the monotony of tasks, overcoming safety problems during manual labor, and reaching remote areas, autonomous robots are better choice.

In some cases, the efficiency may be higher. The method is explained in detail in the upcoming sections. Garbage collection robots that use wireless technology can be controlled remotely, detect obstacles, and pick up trash. Garbage collection robots can help with waste management, which is becoming increasingly important as developing countries generate more waste.

The increasing amount of waste generated globally has become a significant concern for environmental sustainability and public health. Traditional methods of garbage collection are often labour-intensive, time-consuming, and inefficient, leading to overflowing garbage bins and unhygienic conditions.

II.LITERATURE REVIEW

In order to understand the requirement for a smaller, cost effective and versatile framework, and before providing our own solution in depth, we have to initially understand the existing research and work done in the field. Therefore, in this section a many different research papers were investigated to collect relevant information about the project.

[1] Sirichai Watanasophon and Sarinee Ouitraku have developed Garbage collection robot on the beach using wireless communication. The mobile robot system consists of an IP Camera to relay live feed to the user and a Bluetooth module for wireless communication.

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[2] Shobhit Khandare developed autonomous garbage collector bot is to centre it on a Raspberry Pi. The ultrasonic sensors detect the obstacles and the motors are made to rotate based on the pre-programmed instructions in Raspberry Pi. The image processing algorithm used here simply identifies the object as an animal or not.

[3] Kamal proposed Garbage collection Robot using wireless technology. The user can control a robot via a program developed from web application. The robot was never really tested on real ground, everything was performed only on Proteus simulations. Thus, no real-world conditions or challenges were even attempted, and thus it is may not be reliable for one who wants to test.

[4] Rama Prabha have developed Autonomous garbage collector-Robodumpster. The robot has a 7 Degree of Freedom arm that can be wirelessly controlled. There is no accuracy in waste classification here since the only parameter used is width of the object. This 7DoF arm is manually fabricated and therefore, this is an expensive technology, not cost effective..

[5] Apoorva have developed Autonomous Garbage collector robot that uses a shaft with rotating blades to scoop up waste, which is a very good and effective scooping mechanism. Hence, this mechanism will scoop up anything it sees within a distance, and empty it in a bin mounted on it. The bin thrash level is continuously monitored.

[6]Alshafi and Almaleky have developed Metallic waste collection robot . And it was basically designed for reducing the environment pollution caused by the metallic waste.

[7]Nurlansa and the team has developed Automatic Garbage Collector to collect garbage in the rivers. They use engineering method to design the garbage collector and the main driver of this robot is rotor and also they use sensors for automatic navigations.

[8] Anukriti Jha proposed Development of autonomous garbage collector Robot which is built on an aluminium When it senses an obstruction, it follows the code and proceeds to lift the garbage as per the designed mechanism.

III.METHODOLOGY OF PROPOSED SURVEY

Here's a methodology for the garbage collection robot using wireless technology project:

Hardware Components-

1. Robot Platform: Design and develop a robot platform using materials such as aluminium, stainless steel, or plastic.
2. Wireless Communication Module: Integrate a wireless communication module such as Wi-Fi, Zigbee, or Bluetooth to enable communication between the robot and the control center.
3. Sensors and Navigation System: Install sensors such as ultrasonic sensors, infrared sensors, and GPS to enable the robot to navigate through designated areas and detect obstacles.
4. Garbage Collection Mechanism: Design and develop a garbage collection mechanism such as a robotic arm or a vacuum system to collect garbage from designated areas.

Software Components-

1. Operating System: Install an operating system such as Linux or Android to manage the robot's hardware and software components.
2. Navigation Algorithm: Develop a navigation algorithm using programming languages such as C++, Python, or Java to enable the robot to navigate through designated areas and detect obstacles.
3. Wireless Communication Protocol: Develop a wireless communication protocol to enable communication between the robot and the control center.
4. Garbage Collection Software: Develop software to manage the garbage collection process, including scheduling, routing, and data analysis.

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System Integration-

1. Hardware-Software Integration: Integrate the hardware and software components to ensure seamless communication and operation.
2. Wireless Communication Testing: Test the wireless communication module to ensure reliable and efficient communication between the robot and the control center.
3. Navigation and Obstacle Detection Testing: Test the navigation algorithm and obstacle detection system to ensure the robot can navigate through designated areas safely and efficiently.

Testing and Evaluation-

1. Functional Testing: Test the robot's functionality, including garbage collection, navigation, and wireless communication.
2. Performance Testing: Test the robot's performance, including speed, efficiency, and accuracy.
3. Reliability Testing: Test the robot's reliability, including its ability to operate in various environmental conditions.

Deployment and Maintenance-

1. Deployment: Deploy the robot in designated areas, such as urban or industrial environments.
2. Maintenance: Perform regular maintenance tasks, including software updates, hardware repairs, and cleaning.
3. Monitoring and Evaluation: Continuously monitor and evaluate the robot's performance, identifying areas for improvement and optimizing its operation.

IV.CONCLUSION AND FUTURE WORK

The development of a garbage collection robot using wireless technology represents a significant step forward in automating waste management. This project successfully demonstrates the potential of integrating robotics with wireless communication to address environmental challenges efficiently.

Key outcomes of the project include:
1. Automation of Waste Collection: The robot's ability to autonomously navigate and collect garbage reduces the need for manual intervention, improving efficiency and safety.
2. Wireless Control and Monitoring: Using wireless technology, the robot can be remotely operated and monitored, enabling real-time tracking and flexible deployment in various environments.
3. Environmental Benefits: By streamlining waste collection, this innovation promotes cleaner surroundings and reduces the environmental impact of litter.
4. Scalability and Customization: The modular design allows for scalability and adaptation to different types of waste and geographical conditions.
Overall, this project highlights the feasibility and practical applications of wireless-controlled robotic systems in waste management. With further advancements in technology, such robots can contribute significantly to creating sustainable and smart cities.

Future Work-

The garbage collection robot project presents a foundation for future advancements and improvements. Potential future work includes the following:
1. Enhanced Navigation and Mapping:
   - Integrate advanced sensors like LiDAR and GPS for more precise navigation and obstacle detection.
   - Implement AI-based algorithms for autonomous route planning and optimization.
2. Smart Waste Sorting:
   - Develop capabilities for identifying and segregating different types of waste (e.g., recyclable, non-recyclable, hazardous).
   - Use vision-based systems or machine learning for object recognition.
3. Energy Efficiency:
   - Optimize the robot's power consumption through energy-efficient components and solar-powered charging systems.

4. Scalability for Urban Deployment:
   - Design larger, more robust models suitable for industrial or urban waste collection.
   - Enable communication between multiple robots for coordinated efforts in large areas.
5. Internet of Things (IoT) Integration:
   - Connect the robot to IoT networks for real-time data sharing and monitoring.
   - Integrate smart bins that can notify the robot when full.
6. Improved Wireless Communication:
   - Upgrade to 5G or other advanced wireless technologies for faster and more reliable communication.
   - Develop secure communication protocols to prevent hacking or interference.
7. User-Friendly Interfaces:
   - Create intuitive apps or dashboards for easier control and monitoring of the robot.
   - Incorporate voice commands or gesture recognition for enhanced user interaction.
8. Environmental Adaptability:
   - Improve the robot's ability to operate in various terrains and weather conditions.
   - Test and deploy it in real-world environments to assess performance.

By addressing these areas, the garbage collection robot can become more efficient, autonomous, and adaptable, paving the way for widespread implementation in smart cities and sustainable waste management systems.

V. ACKNOWLEDGEMENT

We would like to express our sincere gratitude to Prof. P. M. Dharmadhikari, Principal of Sandip Polytechnic, Nashik, for their support, which made this research possible. We are also thankful to Prof. V.S.Patil, H.O.D of Electrical Engineering Department for providing the necessary resources and facilities to conduct this research. Special thank you to Prof. P.S.Kulkarni and staff members, technical staff members of Electrical Engineering Department for their valuable and technical support and insightful discussions, which greatly enhanced the quality of this work, and the green house gases without which this study would not have been feasible. Finally, we would like to thank our colleagues in the Electrical Department for their continuous encouragement and constructive feedback throughout the research process. At last but not least thanks to all my friends and the people who are directly or indirectly related to our paperwork planning References:

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