

DEVELOPMENT OF TRASH COLLECTOR ROBOT USING ARDUINO R3 WITH IOT BASED MONITORING AND AUTOMATED CHARGING INTERFACE

ABSTRACT

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Automation plays a vital role in enhancing daily life by increasing efficiency and minimizing human effort. This study centers on the development of a trash collector robot using Arduino R3, designed to enhance waste management systems. The robot operates autonomously, using infrared sensors for boundary detection and ultrasonic sensors for obstacle avoidance. An Arduino Uno controller drives two 6V DC motors powered by a 10,000 mAh lithium battery. The system integrates voice recognition for command input, IoT connectivity for real-time monitoring, and dual charging options through solar energy and standard electrical outlets. This project aims to offer a sustainable and intelligent solution for modern waste collection. This study employs the experimental prototyping method to develop and evaluate the trash collector robot. The researchers test the prototype under controlled conditions to assess its usability, efficiency, and sustainability. According to Smith (2021), prototyping allows for refinement of design and functionality before full-scale implementation, ensuring that the developed model meets practical needs and performance standards. The prototype was tested with a balanced sample of male and female respondents, ensuring unbiased usability feedback. The robot successfully demonstrated autonomous navigation, responsive voice command functionality, and efficient obstacle avoidance. Respondents indicated that the system was user-friendly, practical, and accessible, validating its potential for effective waste management. The integration of IoT-enabled real-time updates and the use of solar power with an Automatic Transfer Switch (ATS) ensured uninterrupted operation. The trash collector robot effectively automated the waste collection process, reducing the need for manual intervention while promoting convenience and sustainability. Sensor-driven navigation, IoT monitoring, and dual charging capability contributed to its operational reliability. Although the prototype met its intended objectives, further improvements such as AI-based waste sorting, optimized battery performance, and enhanced solar energy utilization are recommended. Additional field testing across varied environments is also necessary to evaluate long-term durability, environmental adaptability, and security features.

RECOMMENDED CITATION

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