



AUTOMATION OF CAMPUS GARBAGE MANAGEMENT SYSTEM USING IOT

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Abstract: An important first step toward completely changing trash management in educational settings is the automation of the campus garbage management system via the Internet of Things, as demonstrated by the Campus trash management system app. This creative approach makes use of Internet of Things (IoT) technologies to develop a smooth and intuitive platform. Through simple categorization, the app not only simplifies waste disposal but also guarantees real-time bin status monitoring, encouraging a pro-active waste collection strategy. By encouraging recycling programs and reducing needless trash generation, the system essentially integrates sustainability concepts. By integrating a comprehensive reporting mechanism, users may report issues such as overflowing dumpsters to authorities swiftly, facilitating prompt resolutions. The ultimate goal is to cultivate an organized and attentive awareness of the environment.

Keywords - IoT, Campus Garbage Management, Realtime Bin Status Monitoring

Introduction

The "Automation of Campus Garbage Management System using IoT" project represents an innovative step toward transforming waste management across educational campuses. Leveraging the power of the Internet of Things (IoT), this initiative introduces a dedicated app, the Campus Waste Management System, designed to enhance and simplify waste disposal processes.

The essence of the project is to make waste management more efficient on campus. The app incorporates IoT technology, providing an easy-to-use interface that aids in waste sorting and encourages more effective disposal practices. A standout feature is the real-time monitoring of waste bin levels, which helps prevent overflows and ensures timely waste collection.

A key objective of the project is to enhance environmental awareness and promote sustainability within the campus community. It supports recycling efforts and aims to reduce unnecessary waste production. The system not only allows users to sort waste effectively but also includes a comprehensive reporting feature. This enables quick reporting of any issues, like full bins, directly to the campus maintenance staff, facilitating immediate action and maintaining the efficacy of the system.

In an age where environmental responsibility is increasingly crucial, this project is particularly relevant. It aligns with the broader goal of fostering smarter, eco-friendly educational environments through the integration of advanced technology and practical approaches. The Campus Waste Management System app is positioned as a driver of positive environmental and cultural changes on campus. It encourages everyone within the educational institution—students, teachers, and staff—to participate actively in waste management.

II.LITERATURE REVIEW

[1] The IoT-based smart bin prototype aims to improve waste collection systems, reduce environmental pollution, and optimize resource utilization. It provides real-time monitoring, reducing collection times and fuel consumption. The technology also addresses issues like smell pollution, insect breeding, and disease spread. It aligns with smart city development, contributing to a sustainable, environmentally friendly environment. The system offers efficiency gains, cost savings, and reduced energy consumption.

[2] The Rubbish Control and Waste Management Framework for Smart Cities is an innovative IoT-based system designed to address the challenges of overflowing garbage bins and unhygienic environments in cities. The system integrates wireless dustbins with a web-based admin panel, ensuring timely and efficient waste pickup. Ultrasonic sensors monitor fill levels, and an Android app promotes community engagement in waste management efforts. This approach not only streamlines the process but also enhances hygiene and contributes to a healthier urban environment.

[3] The rapid growth of IoT devices necessitates a new network infrastructure, particularly in healthcare. Traditional infrastructures struggle with high-level policies and manual command-line interfaces, making it difficult to implement IoT-enabled networks. SDN technology addresses this issue by simplifying network management and eliminating manual interfaces. This paper explores the benefits, challenges, research directions, and detailed architecture of SDN in IoT healthcare applications.

In [4], The authors propose a flow-based Intrusion Detection System (IDS) to improve detection accuracy against ICMPv6-based attacks. The IDS uses packet-based traffic representation and simple heuristics features, but lacks novel attacks. The enriched features improve detection accuracy by 16.02% and decrease false positive rate by 19.17% compared to state-of-the-art IDSs. The flow consists of packets with similar attributes and distinguishes between normal and malicious traffic behavior.

[5] Blockchain technology is a promising area in the food supply chain industry, particularly in farm-to-fork systems. It provides traceability of food supply from seeding factories to customers. This paper aims to identify blockchain technology with IoT devices to investigate food conditions and issues faced by transporters. Blockchain applications, such as smart contracts, monitor transactions and communicate among stakeholders. IoT technology verifies transactions, enabling a safe and cost-effective FSCM system. The survey contributes to awareness of relevant blockchain applications in the food supply chain.

I. PROBLEM STATEMENT

The need for a comprehensive solution is highlighted by the common issues with traditional waste management systems in educational institutions, such as overflowing bins, delayed waste collection, and a lack of real-time monitoring. In order to solve these problems, the "Automation of Campus Garbage Management System using IoT" project will use IoT technology to bring about sustainability, efficiency, and automation. In order to solve the challenges associated with manual trash disposal processes, the project aims to design a user-friendly mobile app for campus workers and integrate IoT sensors for real-time monitoring of bin levels and smell detection. This effort promotes efficiency, accountability, and a cleaner future by not just correcting weaknesses but also cultivating a sustainable and environmentally conscious culture within educational institutions.

II.PROPOSED SYSTEM

The Campus trash Management System is a cutting-edge program that uses machine learning and Internet of Things sensors to revolutionize trash management procedures in educational establishments. The principal aim of the system is to tackle problems related to inappropriate disposal of waste, including pollution and the growth of landfills. To this end, the system incorporates machine learning-based waste classification, real-time bin status updates, notification alerts, and user-friendly waste categorization.

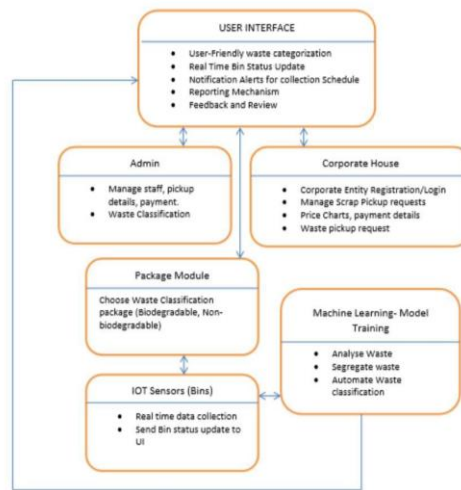


Fig.1 : System Architecture

This paper presents a detailed overview of Campus Garbage Management using IOT. This involves Waste Classification, User Interface, Corporate House Integration, and Reporting and Feedback System.

3.1 Waste Classification

Opportunities to increase efficiency and divert materials from landfills can be found by examining the waste composition of homes and waste management systems. In order to maximize resource recovery, organic waste—which can be composted—must be separated from recyclables like glass, paper, and plastic. Waste sorting can become more intelligent and sustainable in the future as machine learning algorithms, trained on massive picture or sensor datasets, automate this classification process in real time.

3.2 User Interface

Provide a simple, user-friendly interface to facilitate effective disposal of waste. Include functions like scheduling, registration, and feedback posting in the android app we are creating.

3.3 Corporate House Integration

Provide a streamlined procedure for corporate organizations to plan garbage collection times. Provide users with a strong management system so that they can keep an eye on their trash disposal operations.

3.4 Reporting and Feedback System

Reports of overflowing bins could be effortlessly submitted by people through a smartphone app with a "Report Issue" feature. Users' opinions on bin placement, collection frequency, and general satisfaction might also be gathered in a feedback section, which would yield insightful information to improve garbage management.

IV. RESULTS AND DISCUSSION

With this cutting-edge trash management system, users can report overflowing bins and select customized collection plans thanks to an intuitive interface. An Internet of Things (IoT) sensor network collects real-time data on bin fullness. The Machine Learning module receives this data as well as pictures that the user has taken. Here, machine learning classifies waste types automatically, maximizing collection routes and encouraging appropriate disposal of waste.

The central hub is an Admin module that manages staff schedules, pickups based on user requests and sensor data, and machine learning system performance. Through user feedback gathered through the interface, this data-driven approach is continuously refined, enhancing waste management strategies for a more effective, user-friendly, and ecologically responsible system.

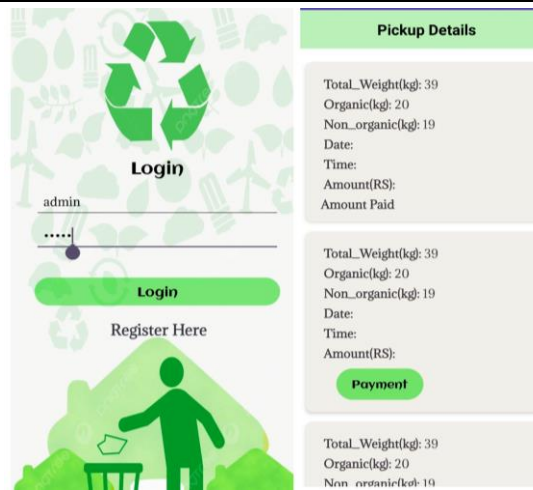


Fig 2: Registration Page

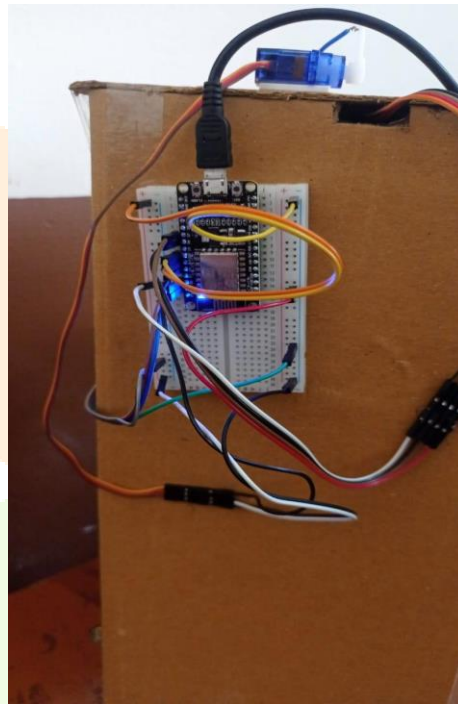


Fig 3 : Dustbin Model

The components used in the above model are NodeMCU ESP8266, Servo Motor, UltraSonic Sensor HC-SR04.

III.CONCLUSION

Finally, by utilizing IoT technology to monitor dust levels in real-time and automate reactions, the "Automation of Campus Garbage Management System using IoT" project introduces a revolutionary method to waste management.

Reducing health concerns, improving garbage collection precision, and encouraging cleanliness are some of its direct effects. It also lays the groundwork for upcoming developments by demonstrating how the Internet of Things can be used to create sustainable ecosystems. Its success on campus provides a model for wider acceptance in urban growth, pointing to a time when smart technologies will influence ecologically friendly waste management practices.

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