IoT-Based Garbage Level Indication System

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Abstract- ***The realization of the sustainable growth of multiple smart systems and gadgets is made possible by the Internet of Things. An IOT-based Garbage Level Indication System is essential for maintaining a clean college campus. Numerous garbage bins are located throughout the College Campus. The manual checking of each of these bins, which are scattered throughout college campuses, could take extra time and effort, and occasionally it results in garbage containers that are overflowing and a bad odor from the waste. Garbage overflow and odor will result in pollution, which will have an impact on the college campus. An IOT-based garbage level indication system is proposed to continuously monitor the Garbage bins and to inform the cleaning Department and cleaning staff about the amount of garbage being collected in the garbage bins on a regular and real-time basis via an Android app. Then workers can take additional steps to empty the bins. This system will be useful in waste management and can be installed in Hospitals, Apartments, Office Buildings, and public places, such as parks and streets, etc.. to help maintain cleanliness and hygiene.***

Indexed Terms- ***Garbage level indication, ESP-WROOM-32, Ultrasonic sensor, Firebase, Android app, Real-time monitoring, Remote access.***

I. INTRODUCTION

The Garbage Level Indication system using ESP-WROOM-32 and an Ultrasonic sensor is a cutting-edge solution for monitoring the level of garbage in a container in real time. The system uses an ultrasonic sensor to detect the distance between the sensor and the garbage level, an ESP-WROOM-32 microcontroller to process the data, and a cloud-based database to store the data.

The data collected by the sensor is transmitted to a Firebase database in real time, where it can be accessed by authorized users from anywhere in the world. The system also includes an Android app that displays the garbage level data in a user-friendly interface, allowing users to monitor the garbage level in real time and generate reports on the waste generation and management process.

The Android app allows users to generate reports on the garbage level over time, providing insights into the waste generation and management process. The reports can identify patterns and trends in waste generation, track the efficiency of waste management processes, and make data-driven decisions to optimize the waste management system.

Overall, this innovative solution provides real-time monitoring of the garbage level in a container and enables users to generate reports on the waste generation and management process. The system is cost-effective, easy to install, and customizable, making it an ideal solution for promoting cleanliness and hygiene

II. LITERATURE SURVEY

The review of the literature on a variety of research to learn more about the work that is currently being done:

Ronit and Priya (May 2017) 'Smart Garbage Monitoring System' [1] being proposed This study, which was executed on a college campus, measures the amount of trash in the bin by using an IoT device

and an Arduino. The system's architecture and implementation are discussed, and highlight its benefits in terms of reducing the cost and time required for garbage collection. the administrator cannot check the status of the bins while off-campus since the data is not uploaded to the cloud, However, it can only show the extremes of full or empty; it cannot predict the percentage of how full the trash can is.

P. A. Thole and N. J. Dhage (March-A 'IoT Based Smart Waste Management System' [2] The system uses an Internet of Things sensing image to measure the amount of garbage in the trash cans and communicate that information to a server for storing and processing. Based on this information, an improvement technique allows for the creation of the primary pathway, which is then communicated to the staff by which they can empty the cans. The overall method is meted out by the Geographical data system.

Dr. Prasun Chowdhury and Rittika Sen (2018) 'GARBAGE MONITORING AND DISPOSAL SYSTEM FOR SMART CITY USING IOT' [3] determine the condition of the smart bins, employing the ultrasonic and MQ4 sensor. All of the data received was sent via the Thing Speak server. A notification is sent via an application to the relevant authorities for the disposal of non-biodegradable trash as soon as the threshold level is crossed. The underlying lid of the biodegradable smart bin will open when the threshold level is reached, allowing the rubbish to be disposed of in the chamber below.
The community can also use the SMS to request a clean-up from the authorities. It updates the municipal corporation on the condition of the trash can. Overall, it's good, however, because it's too expensive and has maintenance requirements, some could abuse it.

Narayan Sharma and Nirman Singha's (Sept-2015) ‘Smart Bin Implementation for Smart Cities' [4] Data on the amount of trash that is being collected in various areas of the city or municipality will be sent via smart bin. Numerous insights can be gained from the analysis of the created dataset. A historical data set will be produced from the data set that has been gathered over time. However, it is difficult to implement and maintain data.

Dr. I. Priya Stella Mary (Nov-2021) ‘SMARGAR’ [5] – An IoT-based Smart Garbage Monitoring System for Preserving Historic College Campuses The proposed SMARGAR system, an Internet of Things-based SMARt GARbage Monitoring System, makes it possible to continuously monitor the trash cans and avoid overflowing of garbage in order to reduce air pollution and eventual harm to the historic college campus buildings. Any emergency event, such as gas leaks or fire mishaps, may be managed by the suggested system in the old campus buildings.

III. PROPOSED SYSTEM

The proposed method for this project is as follows:

- Hardware setup: Developing the hardware, consisting of an ESP-WROOM-32 microcontroller (Wifi module) and an ultrasonic sensor is the first stage. The microcontroller is connected to the ultrasonic sensor, and the Wi-Fi module connects to the cloud.
- Data acquisition: The level of waste in the bin is determined using the ultrasonic sensor. The microcontroller receives data from the sensor and processes it before sending it to Firebase.
- Firebase integration: Firebase is a cloud-based platform that can be used to store and analyze data. The data collected from the ultrasonic sensor is sent to Firebase, where it is stored and can be analyzed.
- Android App Development: To display the garbage level data gathered by the sensor, an Android app was created. The program retrieves the information from Firebase that presents it in a user-friendly manner. The program can be used to create reports on the accumulation of trash over time.

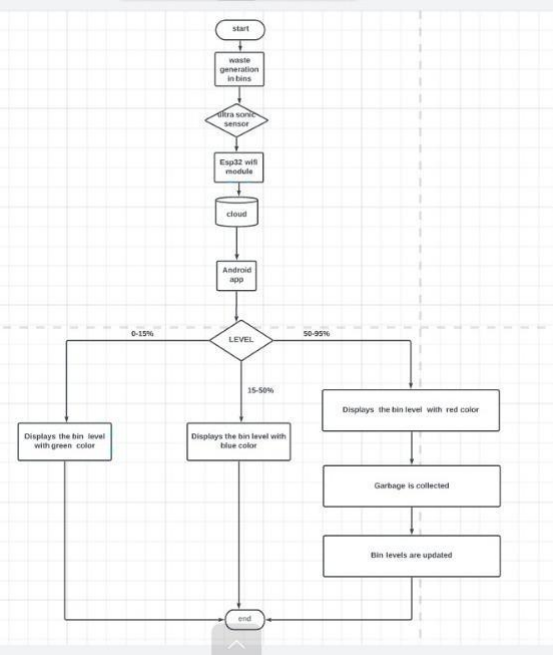


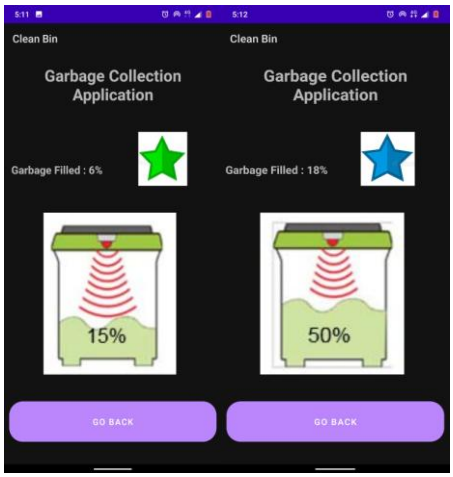
Fig 3.1system architecture

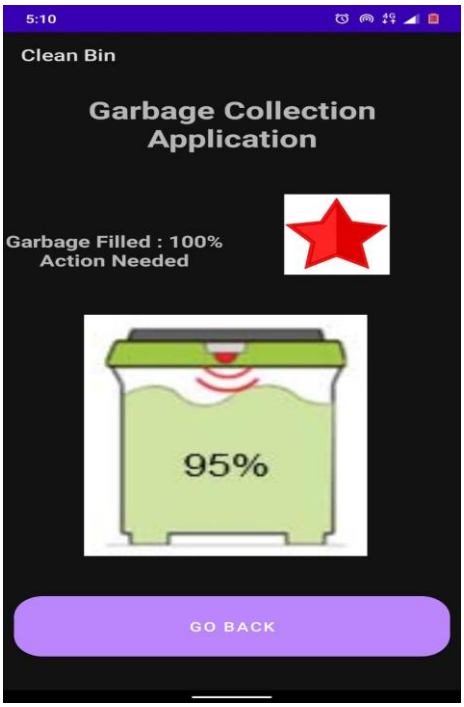
IV. RESULTS

The Garbage Level Indication system is a straightforward yet effective solution for monitoring the level of garbage in a bin.

An efficient method of keeping track of the garbage level in a bin is The project uses an ESP-WROOM-32 microcontroller board to update the garbage level information in a Firebase Real time Database and read distance measurements from an ultrasonic sensor. The garbage level data can be seen in real-time by an Android app, allowing users to keep track of it distantly.

Below images shows the Android Interface according to the system architecture:





V. DISCUSSION & FUTURE SCOPE

This approach offers a potential way to keep track of how much garbage is in a bin. There are nevertheless a number of things that could use discussion and development in the future. The accuracy of the ultrasonic sensor, which is dependent on environmental factors like temperature and humidity, is one of the project's primary limitations. Therefore, for better precision of the waste level monitoring, it might be essential to utilize additional sensors or machine learning approaches.

Despite this restriction, the Garbage Level Indication project offers a number of potential future extensions. For instance, it can be expanded to incorporate numerous bins, enabling waste collection companies to simultaneously monitor rubbish levels in various locations. The system can also be expanded to rural areas, where proper garbage management is often challenging, and integrated with other waste management systems, such as garbage trucks equipped with sensors, to optimize waste collection routes even further. The above will help the area's overall hygiene and sanitation. Additionally, we may create an association with the government municipal department to make arrangements for a truck to pick up the garbage from the filled bins. In general, the Garbage Level Indication project could revolutionize waste management systems by offering an efficient and inexpensive option for managing and monitoring garbage levels.

CONCLUSION

This System provides an efficient and effective solution for garbage level monitoring. By leveraging IoT technology and cloud computing, the system enables real-time monitoring of the garbage level in the bin, providing accurate information to optimize the garbage collection process and prevent the overflowing of the bin. The Android app allows for customizable reporting and remote access to the system, making it a convenient solution for garbage-level monitoring. Additionally, the system is relatively low-cost and easy to implement, making it a cost-effective solution for municipalities, businesses, and individuals looking to optimize their garbage collection process. Overall, this can help to improve the efficiency and effectiveness of garbage collection while reducing the need for human intervention.

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