Garbage Monitoring System using Node MCU

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Abstract— **This article introduces a new method to visualize models of garbage disposal systems using the Internet of Things. Garbage management system, India is the second most populous country in the world and faces the unshakable challenge of establishing a reliable and sustainable garbage management system that can function by itself with or without human intervention. Their classification, accumulation and disposal, and waste disposal forms the basis of the garbage management system. Embedding technology into real-world problems and solving them can create a sustainable system that is included in this document.**

Index Terms— **IoT, NodeMCU, Waste Management, MQTT, Ultrasonic Sensor**[fig5]

I. INTRODUCTION

The rapid population growth and the endless pursuit of wealth improvements have led to excessive use of characteristic assets, leading to rapid and new major changes in the global environment. In turn, changing ecosystems tend to categorize garbage. Animal waste and emissions disrupt the social system and can also have a major impact on the health sector. Therefore, there is now a need for a sustainable garbage management system with or without human intervention. The garbage management system with automatic classification and automatic early warning system has become an important innovative garbage management strategy. The IoT and node MCU controllers set themselves the goal of building and constructing a garbage management system with IoT capabilities by implementing sensors and interfaces in the cloud to fully use forecasts.

II. LITERATURESURVEY

[1] Used raspberry pi which makes it expensive, [2] Used PIC microcontroller and GSM to find the location of the bin,[3] Android application used for communication, [4] There is no segregation of waste but it is cheap,[5] There is no segregation of waste and expensive compared to others, [6] Discusses various methods of implementation,[7] Used machine learning managing the garbage but not for segregation, [8] Used solar power cell instead of electric city which is cost effective,[9] Uses Arduino UNO to check the status of the garbage bin but no segregation of garbage implemented, [10] It does not segregate the garbage but it shows the status of the garbage bin. [11] There is no separation of waste and used Arduino UNO to monitor the garbage bin which bit more expensive.[12] Uses GSM module to communicate and two Arduino bords are required which increases the cost, [13] Uses machine learning to process the data,[14] Uses simple and effective technology like Wi-Fi moduleandamplifiertomonitorthegarbagebin,

[15]Usesgarbage bin and Arduino as the IOT platform for garbage monitoring, [20] Uses Android application as communication platform to monitor the garbage bin.

III. EXISTING WORK ANDSYSTEM

Garbage management systems have existed for a long time, and the existing systems require active human intervention in the garbage management system. Local containers are located in different areas of the city, and workers regularly check and check the capacity of the containers. When it is full. When the container is full, Maximum empties the container, then visits the next container and continues to the next container. Every time an employee must visit and check the condition of the container. This is time-consuming and tedious. In addition, the lack of orderly garbage treatment and the informal classification of material garbage as organic or inorganic, ordinary wet waste has led to the fact that all garbage is disposed of during the treatment process, which in turn leads to material loss or fund loss for an organization or government.

Existing systems also have major disadvantages because there is no relationship between availability, container filling or the location of the fully filled container. You can only schedule a limited visit to collect garbage in the city. Due to the large number of images collected, they are very suitable for processing. Most of the garbage may not be suitable for recycling. If recollected, it will cause delays in response time and inefficient use of manpower.

The automation of garbage sorting and recycling is a huge setback for companies. By automating this expensive and time-consuming manual analysis process, personnel costs can be significantly reduced, and the desired results can be obtained quickly. If the system has a post-alarm function to warn the authorities, the system will increase weight.

IV. PROPOSEDSYSTEM

The proposed system can detect garbage on board and classify it as dry garbage or wet garbage based on its moisture content. Then place them in a suitable container and constantly monitor the garbage level in the container. If the garbage level in the container exceeds 80% or 90% of the bin level, it will automatically send a notification to the respected department stating that the container will be 100% full soon, so they can dispose of the container as soon as possible. It may be emptied. The whole process is fully automated, and the data is stored in the cloud to Avoid time delay and labor. The proposed system includes a NodeMCU controller,

an ultrasonic sensor, an infrared sensor, a humidity sensor, and an MQTT protocol for sending alerts to regulatory agencies. Before initiating the sending process, the split setting will be used to detect wet and dry garbage and classify accordingly.

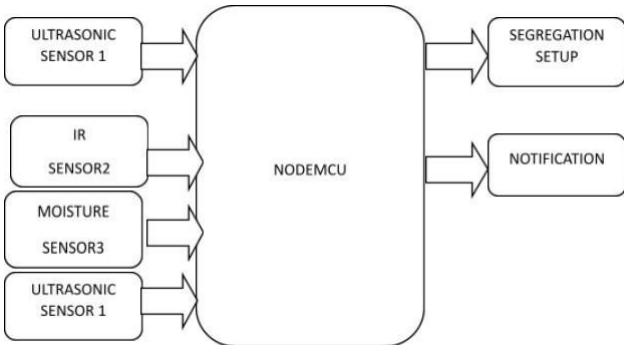


Fig 1. Block Diagram of the Proposed Waste System

A. WASTE SEGREGATION SYSTEM

The garbage sorting system is a key element of the Internet of Things in the garbage management system. This is the first step towards a garbage sorting system. In the process of this system, garbage is classified as wet or dry. It implements a humidity sensor and an infrared sensor. Control and therefore transfer the control circuit to humidity sensor. If the value of the humidity sensor is equal to or greater than 1, it indicates that the garbage on the board is WET. This fact can be proved to be correct by simple physical applications, because the liquid conducts electrical pulses within itself. Once garbage is classified as WET a simple DC motor is used to dispose of garbage in BIN 1 or BIN 2.

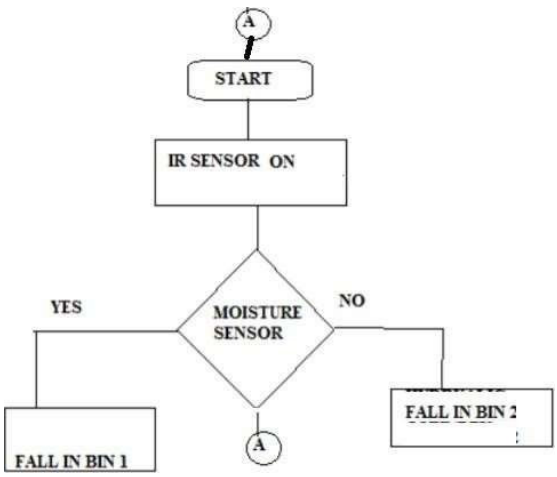
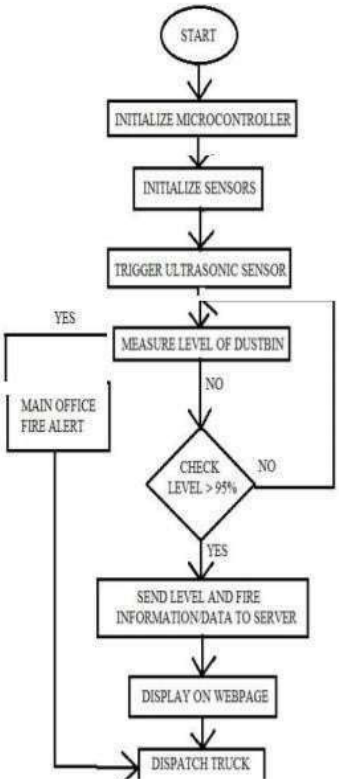


Fig 2. Process flow diagram of the Waste SegregationSystem

B. DATA PROCESSING SYSTEM

The second stage of the proposed garbage monitoring system is the data processing system. The container data will be continuously monitored and when the level exceeds the threshold; then the alert system will be activated via the cloud.

Fig 3. Process flow diagram of the Proposed Data Processing System



The ultrasonic sensor is preferably located in the vicinity of the container. When the garbage accumulated in the container, the ultrasonic sensor will become high when it is 90% full as in our implementation and can be changed to a civil institution.

Fig. 4

C. CLOUD & MESSAGE ALERT SYSTEM

The cloud used in this system is the Cayenne Cloud. Cayenne Cloud is implemented in the message warning system, which is a subset of the warning system. This is achieved through the MQTT protocol. MQTT is the abbreviation of Message Queue Telemetry Transmission Protocol, and it is one of the most widely used protocols in the Internet of Things related protocols. MQTT allows IoT devices with limited resources to send or publish information about specific topics to a server that acts as an MQTT message broker. Permanent data is tracked and stored in the Cayenne cloud. The container data can be monitored in real time every day, and the container data can be downloaded at any time for any analysis purpose.

V. HARDWARE*DESCRIPTION*

NodeMCU[fig.5] is the basic control of the system. NodeMCU is very useful and comes with multiple expandable pins to enhance and illustrate how IoT works. Sometimes this can be an improved version of the Arduino controller, but the advanced built-in programmable Wi-Fi function can also be used to send alerts to government agencies via Wi-Fi. This can also be seen as a further improvement to the proposed project.

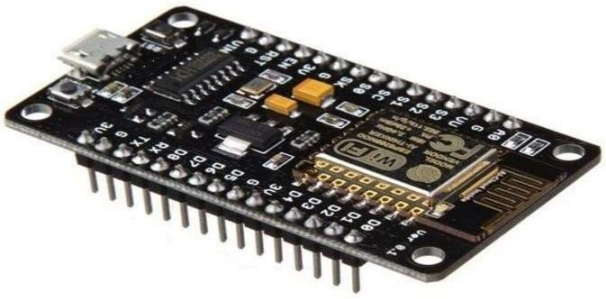
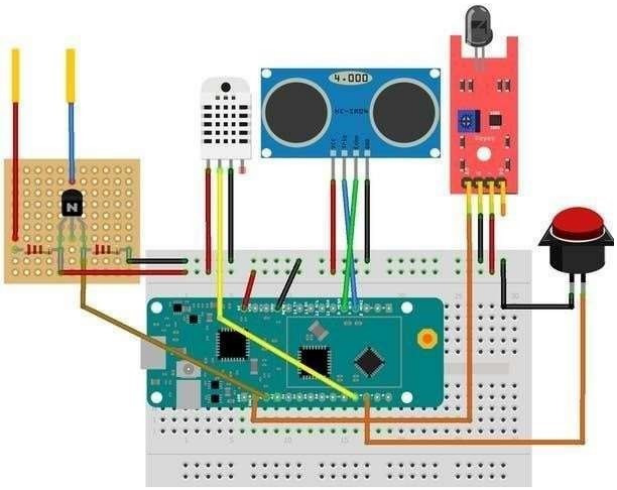


Fig. 5

A. SENSOR POSITIONING & CIRCUIT DIAGRAM

The infrared sensor is best installed near the board where the garbage is placed. This is useful for evaluating accurate results. The schematic below is a copy of the proposed system.

Fig 6. Circuit Diagram of the Hardware System



VI. RESULTS

The results of this project may be very useful. Multiple residues can be isolated and tested. When the container is 90% full, the warning system can be activated. The system works efficiently, depends on constant weather conditions, and is fully functional. Achieved the goal.

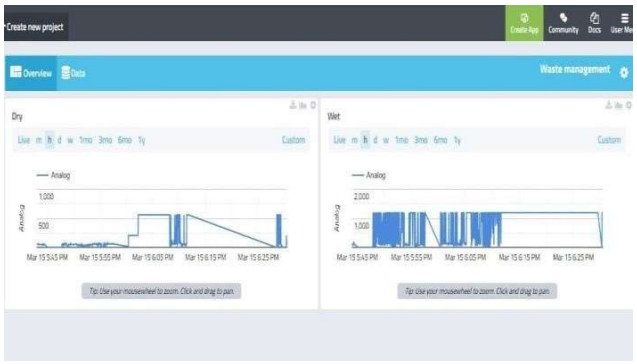


Fig 7. Cayenne Cloud Result

VII. FUTURESCOPE

The same implementation was tested in NodeMCU and it works well, but Raspberry Pi also has an extensive imaging library, so it can also be used for the same applications. In addition, compared to other controllers, the extra memory used to store all recorded videos/images on the RaspberryPi.

During the operation of the system, data can be called from the cloud at any time. This data can be used to predict and calibrate systems running various machine learning algorithms and predict the usage of the container at a specific date and time. This will help the respected department predict containers and help road transportation for early cleaning.

VIII.CONCLUSION

The traditional garbage monitoring system is becoming an intelligent system. The IoT-based garbage monitoring system is very useful for remotely monitoring the garbage in the garbage cans in different locations. The system reduces costs and saves time. The system also reduces manpower, which is very beneficial to users and it is user friendly system.

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