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AN IOT BASED WASTE MANAGEMENT AND SEGREGATION SYSTEM USING NODE MCU

[1] Mr. K. Kannaiah , [2] Ch. Chandra Jyothsna,[3] B.Sowmya,[4] I.Dhanush,[5] Ch. Charan Sai
[1] Assistant Professor,[2,3,4,5] B.Tech scholar, Dept. of E.C.E
[1,2,3,4,5] N.B.K.R Institute of Science And Technology, Vidyanagar, SPSR Nellore Dist., A.P

ABSTRACT:

This project takes a novel approach to providing an illustrative model of Waste Management systems through the use of IoT. System for Waste Management Garbage separation and monitoring is a critical issue in most Indian cities. The current garbage monitoring and management system is inefficient, which contributes to high transportation and collection costs. Garbage bins are seen overflowing in certain areas due to poor monitoring and collection, which can lead to long-term issues such as bad odour and harmful diseases. On the contrary, in some areas, garbage collection trucks end up collecting garbage from bins with low garbage levels, resulting in increased gasoline consumption and air pollution. To address these issues, a "NodeMcu-based smart garbage monitoring system" can be introduced as a viable solution. It uses the ultrasonic sensor as a level detector to detect the amount of garbage in the bin. And also moisture sensor is used to segregate dry and wet waste.

I.INTRODUCTION

IoT, or Internet of Things, refers to a network of interconnected physical objects that can communicate and exchange data without the need for human intervention. It has been formally defined as a "Information Infrastructure." "Society" because IoT allows us to collect data from various mediums such as humans, animals, vehicles, and kitchen appliances. Thus, any physical object that can be assigned an IP address to enable data transmission over a network can be integrated into an IoT system by embedding it with electronic hardware such as sensors, software, and networking gear. IoT differs from the Internet in that it goes beyond Internet connectivity by allowing everyday objects with embedded circuits to interact and communicate with one another. Manufacturers have gained insight into how their products are used and how they perform in the real world, and they have increased their revenues by providing value added services that enhance and extend the lifecycle of their products or services. Consumers, on the other hand, can integrate and control multiple devices for a more personalised and improved user experience. In this paper, we will propose a system for immediate dustbin cleaning. Because a dustbin is considered a basic need for maintaining the level of cleanliness in the city, it is critical to clean all dustbins as soon as they become full. The IoT network consists of embedded electronics, sensors and software that allows these devices to send and receive data among each other. This is why it is beneficial to use such an existing infrastructure for designing the proposed security system. The disadvantages of the existing system are that the employees have to go and check the bins daily whether they are filled or not, it results in high cost. If the bin doesn't get

emptied on time then the environment becomes unhygienic and illness could be spread. The proposed system will help in removing all these disadvantages. The real-time information can be gained regarding the level of the dustbin filled on the system itself. It will also help in reducing the cost as the employees will have to go only at that time when the bin is full. This will also help in resource optimization and if the bins will be emptied at time then the environment will remain safe and free from all kinds of diseases. The cities will become more cleaner and the smells of the garbage will be much less.

II.LITERATURE REVIEW

In [1] proposed a Smart Dustbin based on IoT, in which the smart bin was built on a platform based on an Aurdino Uno board that was interfaced with a GSM modem and an ultrasonic sensor. The sensor was installed on top of the bin. A 10cm threshold was established. When the garbage reaches a certain level, the sensor activates the GSM modem, which alerts the associated authority until the garbage in the bin is emptied. Finally, it was determined that various issues such as affordability, maintenance, and durability were addressed when these smart bins were designed. It also helped to create a sanitary and clean environment while building a smart city.

The researchers [2] propose the following method for garbage management. The bin was linked to a microcontroller-based system with IR wireless systems and a central system that displayed the current status of the garbage in the bin. Using Wi-Fi, the status was viewed on a mobile web browser with an html page. To save money, they only used weight-based sensors, and the sender only used a Wi-Fi module to send and receive data. Finally, the sensor could detect the weight of waste in the bin but not the level of waste.

The author proposed a method for organizing the collection of the garbage in the commercial and residential areas of the cities [3]. In this system, the level of garbage in the bin was detected by the ultrasonic sensor which will send the data to the control room using the GSM module. A GUI was also developed to check the information that was related to the garbage for different locations, GUI was based on MATLAB so it was different. Two units were present in the system, slave unit was in the bin whereas the master unit was there in the control room. The sensor will check the level of garbage and send it to the slave unit which will further send the data to master unit which at last will inform the authorities to clean the bin. This paper proposed Decision Support System which would be used for garbage collection in the cities[4]. This system dealt with the ineffective waste collection in the city's inaccessible areas. The cameras were placed in areas of the cities where there were the most problems. The system worked in two parts. The first was to find companies that were involved in waste collection and owned trucks, as well as those who could organise some drivers to collect garbage from various parts of the city in the truck and pass it on to city dumps or recycling organisations. The second part was to create a system that could handle all of the people involved's communications as well as the data that would be collected while working around the city. Various bins were placed throughout the city, each with an embedded device that was inexpensive and assisted in tracking the garbage level in the bins [5]. Each bin was assigned a unique ID to make it easier to determine which bin is full and ready to be emptied. The project is divided into two sections, one for the transmitter and one for the receiver. The transmitter section consists of a microcontroller and sensors that check the level of garbage and pass the data onto the system via the RF Transmitter, after which the RF Receiver receives the data and sends it to the associated client so that the bin can be emptied.

III.EXISTING SYSTEM:

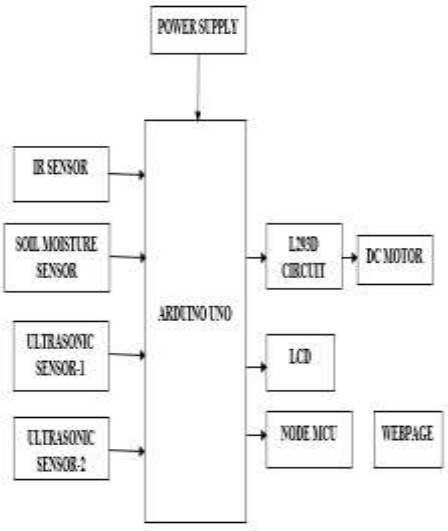
Waste management systems have existed for a long time. Existing systems in Waste Management systems rely heavily on human intervention. Local bins are placed at various points throughout the city. Manual labour checks the same at regular intervals and checks the capacity of the bins, whether it has been filled to capacity, empties the bin if full, and then visits the next bin and repeats the process. Every time the Manual Labor is required to visit the bins and check their status. This is time-consuming and exhausting. Furthermore, the lack of orderly waste clearance and informal segregation of material wastes into organic or inorganic, wet or dry waste results in the dumping

of all wastes into the same treatment process, resulting in material and monetary loss to the organisations or government.

IV.PROPOSED SYSTEM:

The proposed system detects the waste on board and classifies them based on the moisture content as dry or wet waste. It is then being placed in the appropriate bins and the levels of the bins are continuously monitored. In case the level on the bins exceeds 80 or 90% fill stage, there is an automatic notification sent to the civil authorities, intimating that the bin would be 100% filled soon, thus enabling the possibilities of them clearing the bin asap. The whole process is completely automated and the data is stored on the cloud, so as to avoid delay in time and involvement of human labor.The Proposed system constitutes the NodeMCU Controller, Ultrasonic Sensor,IR Sensor, Moisture Sensor and deploys MQTT Protocol for sending alert to the authorities. Prior to initializing the Data Sending Process, a Segregation setup in used to detect the wet and dry wastes and classify them and sort them accordingly. The system comprises of three sections viz a viz , Waste Segregation System , Cloud Server System, and the Data Process System.

BLOCK DIAGRAM:



V.MODULE DESCRIPTION:

A.Arduino uno:

The Arduino UNO is powered by an ATmega328P microcontroller. It is simple to use when compared to other boards, for example, the Arduino Mega board, and so on. The board is made up of computerized and simple Input/Output (I/O) pins, safeguards, and various circuits.

The Arduino UNO has six simple pin inputs, fourteen digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It's written in IDE, which stands for Integrated Development Environment. It is compatible with both online and offline platforms.

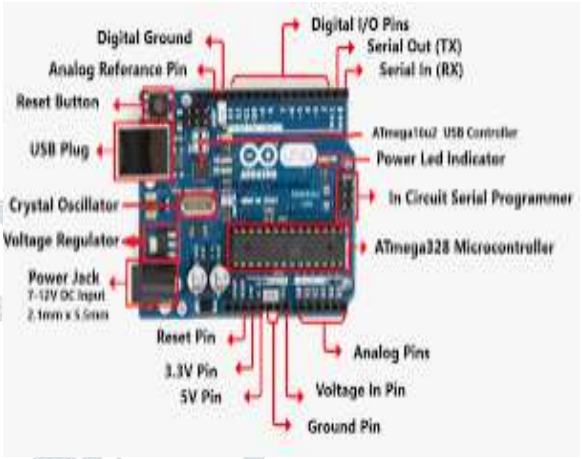


Fig 1: Hardware component Arduino uno

B. NODE MCU ESP8266 WI-FI MODULE:

The NodeMCU (Node Microcontroller Unit) is an open-source programming project that uses environmental parameters to create a cheaper System-on-a-Chip (SoC) known as the ESP8266. The ESP8266, designed and implemented by Espressif Systems, includes all the essential components of a computer: CPU, RAM, networking (Wi-Fi), and even an operating system and SDK. The ESP8266, on the other hand, is similarly difficult to access and utilize as a chip. You'll need to patch wires to its pins with the appropriate basic voltage for the primary tasks, like as turning it on or sending an input to the chip's "PC."

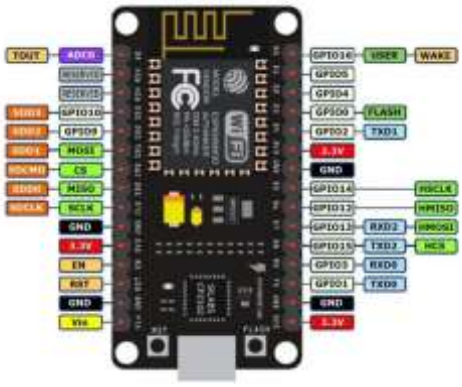


Fig 2: Node MCU

C.ULTRASONIC SENSOR:

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target). In order to calculate the distance between the sensor and the object, the sensor measures the time it takes between the emission of the sound by the transmitter to its contact with the receiver.

Fig 3: Ultrasonic sensor

D.GAS SENSORS

Gas sensors (also known as gas detectors) are electronic devices that detect and identify different types of gasses. They are commonly used to detect toxic or explosive gasses and measure gas concentration. Gas sensors are employed in factories and manufacturing facilities to identify gas leaks, and to detect smoke and carbon monoxide in homes. Gas sensors vary widely in size (portable and fixed), range, and sensing ability. They are often part of a larger embedded system, such as hazmat and security systems, and they are normally connected to an audible alarm or interface. Because gas sensors are constantly interacting with air and other gasses, they have to be calibrated more often than many other types of sensors.

Fig 4: Gas sensor

V.RESULTS:

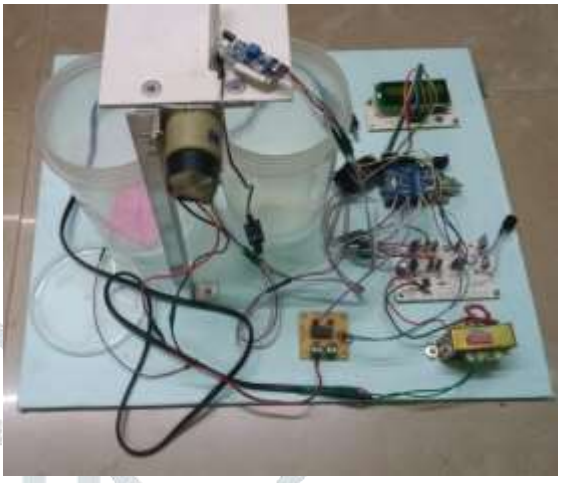


Fig 5:Hardware implementation

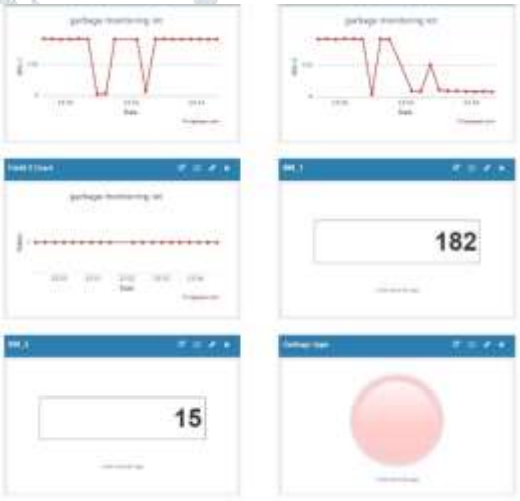


Fig 5: Sensor Data in webpage

VL.CONCLUSION:

With growing urbanisation and increasing population, effective waste disposal is a major concern. Manual waste segregation is very expensive, time consuming and inefficient. This paper presents a smart and cost effective solution for waste segregation. The proposed SmartBin is an efficient waste segregation system that requires no human intervention to separate dry and wet waste and paves the path for timely collection and disposal. The proposed system can be deployed a domestic scale in households or on a large scale in public places.

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