DESIGNAND DEVLOP THE APP FOR SMART GARBAGE MANAGEMENT SYSTEMUSING IOT

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ABSTRACT: In India, the volume of waste generation has been increased rapidly over the last five years. In 2020,147,613 metric tonnes of solid waste are generated per day from 84,475 wards. Timely cleaning of dustbin is a big challenge and if left unaddressed, it may pose several health risks by making the place unhygienic. Current system for the waste management in local areas of highly populated cities is sluggish which leads to a lot of garbage strewn all over the city. The rate of generation of waste is so high that if the garbage collector doesn't visit a place for a couple of days or week it creates the conditions adverse. This project proposed a GarBin an IoT based garbage level monitoring system and alarming services to pick the trash at the right time before a garbage bin overflows and cause discomfort to general public.This system which consists of ATMEGA 328p 8-bit Controller, RFID Tag, RFID Reader, Buzzer and ESP8266 Wi-Fi Transmitter those are interfaced to the cloud using IoT (Internet of Things) and monitored by the admin using GarBin monitoring system and also develop a mobile app such as admin app, cleaner app, citizen app to streamline the entire process of waste management in the city and the state. Installing these GarBin to residential places helps the government to work efficiently when it comes to keeping the city clean and saving millions of dollars a year by saving fuel / energy, labour cost and time, on top of this improvement in general public health which could save millions of lives and billions of dollars around the world otherwise which would have spent on health due to poor management of waste.

Keywords: GarBin, IoT

I. INTRODUCTION

There have been very ambitious plans which have been drafted by the government of India, in order to make the country liveable and clean for all. One such initiative is that all rural homes are to receive piped water by 2024, as per the Jal Jeevan Mission announced by PM Modi. This will be a 3.5 lakh crore mission and aims to eliminate the need to walk for kilometres just to get access to drinking water. Alongside is the Swachh Bharat Mission – a nationwide imitative to clean up India's act, and to set up sustainable systems to support a clean India. There have been numerous innovative contributions by brands under this initiative, such as machines to eradicate manual scavenging, methodologies, and practices that encourage recycling, and so on. The focus is also to let the entire movement be a people's movement, wherein everyone in the community contributes their part to make the country a cleaner place to live for all. A huge problem that plagues our country is waste management. We thought it would be best to do our part and contribute to the movement with our IoT-enabled GarBin solution.

II.HEALTH RISKS

Timely cleaning of dustbin may be a big challenge and if left unaddressed, it should pose several health risks by making the place unhygienic. Current system for the waste management in local areas of small and highly populated cities is sluggish which ends up in plenty of garbage strewn everywhere town. the speed of generation of waste is so high that if the rubbish collector doesn't visit an area for a pair of days it creates the conditions adverse. observed that the rubbish truck use to travel round the town to gather solid waste twice daily. Although this method was thorough it absolutely was very inefficient. for instance, for instance street A could be a busy street and that we see that the rubbish fills up really fast whereas maybe street B even after two days the bin isn't even half full. With the overcrowding of cities, the clearance of garbage has become the foremost challenging task for civic bodies. Thus, a well-planned garbage monitoring system is crucial to stay the environment clean. Keeping in mind the above scenario, this paper proposes a sensible garbage monitoring and alert system using the concept supported the web of Things (IoT) to keep up cleanliness and hygiene in any locality. this method gives a true time indicator of the rubbish level in an exceedingly trashcan at any given time. Using that data, we are able to then optimize waste collection routes and ultimately reduce fuel consumption. It allows trash collectors to plan their daily/weekly devour schedule.

III.EMBEDDED SYSTEMS

Internet of Things is that the concept of connecting devices via the web to exchange data. it's the foremost trending technology during this contemporary world as we are ready to control the embedded devices from any location using the net of things. In sum, the net of Things (IoT) is a process with sensors, actuators, and processors that involve hardware and software systems, web APIs, and protocols, which together create a connected environment of embedded systems.

IV.MATERIALS AND METHOD

a) EXISTING SYSTEM

Waste management systems play a significant role in reducing the unhygienic objects from a selected area. To avoid these conditions, a wise waste management system (SWMS) is proposed that's supported IoT technology. The SWMS consists of public garbage collectors with embedded technology that's wont to monitor real-time level of garbage bins public places. supported the extent of garbage bins, an optimized path is chosen for the rubbish collecting van that eventually reduces fuel cost. The SWMS separate the garbage bins into master bins and slave bins. Each garbage bin consists of three sensors, like level sensor, humidity sensor, and cargo sensor. The master bin is consistently transmitting its data to the cloud with the assistance of Wi-Fi. Through real-time monitoring, accurate reports will be generated, and, therefore, the efficiency of the system is enhanced. Overflowing of trash in dustbins at public places increases unhealthy environment for the people, especially, in developing countries; this creates serious health problems for the citizens and environmental pollution. To deal with these varieties of situations, an IoT-based garbage monitoring system (GMS) is proposed. The system contains various dust bins that are distributed within the city. Dust bins transmit the info to concerned authorities so as to scrub the rubbish. The diagram of the proposed model consists of two sections, that is, transmitter and receiver sections. The transmitter is installed in dustbins, which is employed to transmit collected data from sensors to the receiver end. At the receiver end, the central system receives the information sent from the dustbin and processes it accordingly. The authors used Raspberry Pi, RF receiver, and an online browser to fulfil the wants of the system. The proposed system has few constrains in terms of lacking in reliability of communications among different modules. Overflowing of dust bins at public places increases unhealthy environment for the people, especially, in developing countries and developed countries; this creates serious health problems for the citizens and leads to environmental pollution. To deal with these sorts of situations, an IoT-based garbage monitoring system (GMS) is proposed. The system contains various dust bins that are distributed within the city. Dust bins transmit the info to concerned authorities so as to wash the rubbish. The diagram of the proposed model consists of two sections, that is, transmitter and receiver sections. The transmitter is installed in dustbins, which is employed to transmit collected data from sensors to the receiver end. At the receiver end, the central system receives the info sent from the dustbin and processes it accordingly. The authors used Raspberry Pi, RF receiver, and an internet browser to fulfil the wants of the system. An IoT-enabled solid waste management system is proposed for monitoring garbage bin and dynamic routing of the rubbish collectors. The proposed system consists of an embedded system with IoT for real-time monitoring and scheduling the optimal routes for garbage trucks. The architecture of the proposed system is shown in Figure 4. A mobile application is additionally designed for the trucker to handle the information coming from garbage bins and further transmitting it to the cloud. within the proposed system, two garbage bins are installed in one place and solid waste is segregated from dry and wet garbage bins. The system is efficient in decision-making because it uses the GPS module and Google Map API for locating the optimal route to achieve the rubbish bins.

b) PROPOSED SYSTEM

To make the system of cleaning the entire city on regular basis, the residential in addition as commercial waste collection method had to be implemented. As vehicle is meant to gather the household waste from the doorsteps of the residence, residents developed a habit of storing their garbage in bin till vehicle of Door-to-Door collection system reaches to them. the concept of GarBin is for the Smart buildings, Apartments, Villas, Colleges, Hospitals and Bus stands. The GarBin thus thought is an upgrading of standard dustbin by elevating it to be smart one using sensors and logics. GarBin could be a new idea of implementation which makes a standard dustbin into smart dustbin using sensors for garbage level detection and transmitting the message to the server using MQTT protocol. An ultrasonic sensor is going to be placed on the inside side of the lid, the one facing the solid waste. As trash increases, the gap between the ultrasonic and also the trash decreases. This live data are sent to our micro-controller. Our Atmega 8 controller then processes the information and thru the assistance of WiFi sends it to an online server. RFID is employed to detect where the trash has been disposed. It receives the RFID data from the GarBin through the net with the assistance of a Wi-Fi module (ESP8266). to test whether it's the correct bin or not it uses an RFID reader. As soon because the autonomous car which is assigned to gather garbage receives this RFID data, the corresponding ‘Smart Bin’ number gets stored within the database of the car through the net. The RFID data only appears when all the containers are full and need cleaning process. Therefore, after receiving the info, vehicle executes the work of finding its path towards the ‘Smart Bin’. Next, it verifies the RFID response of the containers. If the response matches, it cleans the bins and sends ‘Empty’ as an entry within the status field of Smart Bin’s database.

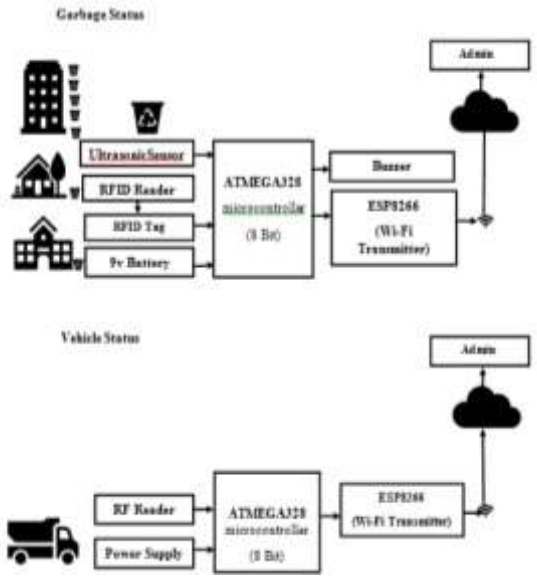

Figure 1 Block Diagram of Proposed Work

ADVANTAGES OF PROPOSED SYSTEM:

- The efficiency of cleaning the waste is high
- Smart sensors are used to measure the waste, So the accuracy is high

V.MODULE DESCRIPTION

a) GarBin Dashboard

As the central monitoring system, we intend a GarBin Dashboard website connected to a database. Basically, it is the communication channel for the GDU. Since our system communicate remotely, it requires internet connectivity and a server. HTML has been assistance to construct the primary structure of the webpages. While running the server either on a user terminal or admin terminal, we see the outcome of HTML syntax along with CSS to enhance the website visibility. Next for the three main parts of the back-end-server, an application, and database we adopted JavaScript, more specifically PHP. Data cannot update on a webpage without the help of a database named 'MySQL'. Later the required data have collected from MySQL to update them to the webpages. SQL has been utilized to handle the database as a query language. The GUI of the application includes a display gauge which represents the quantity of waste present in the dustbin. An email notification can also be sent to the user via the application. When the dustbin gets 80% full the user is sent an email alert. GarBin data is collected and through which the data analysis can be done through which the report the area or place can be generated and analysis can be done. The level of the waste is monitored and updated frequently. Cloud can be accessed from anywhere with the internet connection. Thus, real time monitoring of GarBin can be provided. The GDU communicates with each other by transmitting the container's RFID identity and its status (Empty or Full). Whenever the bin attains its intake level, it updates a new entry in the table and renew the database. As soon as after the new data has inserted the WebPages updates their contents as well. This information afterwards gets transferred to the autonomous vehicle, and it acknowledges the containers' status.

b) GarBin MIT app

GarBin application is designed using MIT App Inventor through which users can open the dustbin and collect points based on the amount of waste thrown by them. MIT App inventor is a cloud-based integrated development environment (IDE) used for developing mobile applications online.In our project the cleaner side application is developed where it fetches the data from the cloud server and displays it to real time database the end-users it also provides the google maps extension for navigating to the garbage bins.

Admin App	Cleaner App	Citizen App
Login the app	Login the app	Login with GarBin
Add Cleaner	Garbin Status	Raise Complaint
AllotGarBin	Plan to Pick up	History of the Pick
Provide Award		View Awards
Warn Citizen		View Warning

VI. HARDWARE DESCRIPTION

a) GarBin Unit

A GarBin mainly comprises of an ultrasonic sensor to measure the unfilled level of a trash bin, a RFID module to detect the cleaning time and date, a host micro-controller to process the data, an ESP8266 module for wireless transmission, and a power management unit.

b) HC-SR04 Ultrasonic Distance Sensor

Garbage level detection is that the done by ultrasonic sensor (HC-SR04). The ultrasonic sensor is placed on top of the dustbin facing the underside. The sensor continuously transmits the sonic waves, when the sonic waves hit the object and reflect back, the echo in the sensor senses the waves and calculates the distance of the object. Ultrasonic sensor senses the trash level based on range i.e Range from 24 to 15 Low Level, range from 15 to 5 Half filled, Range Less than 5 Complete filled. This is the HC-SR04 ultrasonic distance sensor. This sensor can measure non-contact measurement upto 2cm to 400cm with a ranging accuracy that can reach up to 3mm. Each HC-SR04 module having an ultrasonic transmitter, a receiver and a control circuit. There are only four pins that you just have to worry about on the HC-SR04: VCC (Power), Trig (Trigger), Echo (Receive), and GND (Ground). This sensor has additional control circuitry that can prevent inconsistent "bouncy" data reckoning on the application.

c) EM-18 RFID Reader

Radio-frequency identification (RFID) is that the wireless non-contact use of radio-frequency electromagnetic fields to transfer data, for the needs of automatically identifying and tracking tags attached to object. The tags contain electronically stored information.EM-18 RFID Reader could be a Tiny, simple to use RFID reader module. With a built-in antenna, the only holdup is that the 2mm pin spacing. Power the module, hold up a card, and acquire a serial string output containing the unique ID of the card. Its output is in the form of TTL output. RFID is an acronym for “Radio-Frequency Identification” and implies that the technology whereby digital data encoded in RFID tags or smart labels (defined below) are captured by a reader through radio waves. RFID is comparable to barcoding in that information from a tag or label are captured by a device that stores the information in a database. RFID, however, has some advantages over systems that employ barcode asset tracking software. The foremost notable is that RFID tag data can be read outside the line-of-sight, although barcodes must be aligned with an optical scanner.

d)ESP 8266

The chip first heeded by the Western makers in August 2014 with the ESP-01 module, which is made by a third-party manufacturer Ai-Thinker. This module permits microcontrollers to attach to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, initially there was almost no English-language documentation on the chip and therefore the commands it accepted. The very low price and therefore the proven fact that there have been only a few external components on the module, which suggested that it could eventually be very affordable in volume, fascinated by many hackers to explore the module, chip, and also the software thereon, similarly on translate the Chinese documentation. The ESP8285 is combination of an ESP8266 with 1 MB of built-in flash, with single-chip devices capable of connecting to Wi-Fi.

IX) OUTPUT ANALYSIS

After the implementation of smart garbage management system, it is noted that the level of waste disposal system has improved. It also helps the people to dispose the wastes at a proper time. So, the time and work of the workers and peoples are conserved. By using the IoT system the wastes are monitored thoroughly through all areas are completely

monitored and cleaned. Sometimes warnings and appreciation have been sent to the respected users. Here the ultrasonic sensor plays a vital role, it monitors the waste accordingly and sent the data to both admin and cleaner systems.

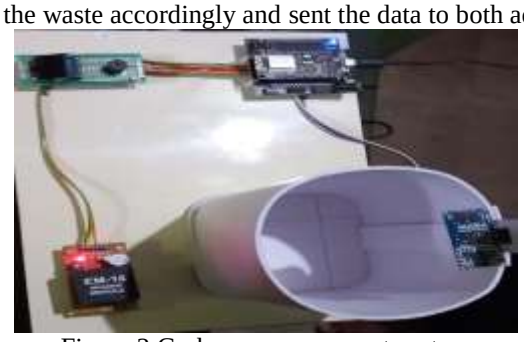

Figure 2 Garbage management system

Figure 3 Vehicle status

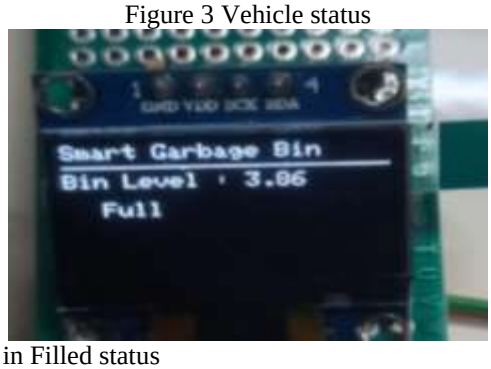

Figure 4 Garbin in Filled status

Figure 5 Garbin status in low level

Figure 6 Home interface

Figure 7 Login interface of admin

Figure 8 Cleaner status

X)RESULTS AND DISCUSSION

We have implemented the PHP program to design the software application to monitor the GarBin status for admin, cleaner and public. By using this application admin can monitor the cleaner and also the GarBin level. The admin can view the complaints which are raised by the public. By using this application admin can instruct the cleaner to collect the waste in the area where GarBin is almost filled. The cleaner also can track the GarBin through this application. Public can raise a complaint through this application and also, they can view the history of garbage collected by the cleaner in their area. If the public didn't put their waste in GarBin properly, they can be warned by admin through message.

IV.CONCLUSION

Conventional solid waste management systems have several drawbacks in terms of tardily unloading, hindrance in new techniques, insufficient in throughput, less access to actual data, and many more. Therefore, an advanced approach is the need for the time to rectifying all existing problems in the waste collecting process. Generally, waste collection has more expenditure of cost from the municipality budget. In this project, a real-time Garbing monitoring framework is proposed to get real-time access to data from the garb bins and enforce the collecting procedure accordingly. The collection of waste is probably the most important process for waste management systems. Route optimization could be the greatest point to be able to reduce the costs for the operation of managing solid waste. Operating costs like labour, fuel, and equipment can lower as efficiency increases. Hours of labour can be lessened along with mileage on service vehicles. Managing routes of waste collection efficiently is attributed to reliable systems put in place to detect locations that need service, and the information which can assist you predict how often. IoT solutions enables cities to function smarter.

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