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IOT BASED GARBAGE MONITORING SYSTEM AND NOTIFICATION APPLICATION

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Abstract: **In today's world there is an immense growth in the population of the cities due to this rapid urbanization there is a waste collection that leads to various infectious diseases in the environment. There is a concept with the prototype which we have built that is the Recycle, Reuse, Reduce policies throughout this waste management system.**
To prevent these bins from becoming overloaded, access to real-time information about each bin is available. The suggested structure lowers personnel costs while also saving the system time and energy. access to each bin's real-time information, preventing overcrowding of these bins. access to each bin's real-time information, preventing overcrowding of these bins. The suggested structure lowers personnel costs while also saving the system time and energy. We mostly utilized Arduino, NODEMCU, Servo Motors, and Ultrasonic Sensors to build this prototype. The software element is the Blynk app, which is utilized to receive notifications. This concept might serve as the foundation for a smart waste disposal system in urban areas.

Keywords **–Arudino, ultrasonic sensors, Arudino IDE, GPS module**

I. INTRODUCTION

Day A smart City is a city development that is usually done and helps in managing multiple times the various communication technology. Waste management has been the major issue as well as the task in most of the cities so that they inculcate the best way of waste disposal method. Today in most of the public places there are no proper method is followed because we cannot monitor the dustbins manually. Introduction of the smart bin and using the sensors to monitor them using embedded systems for real time data processing. This data will have a optimization method to know the various applications such as saving money, saving fuel and importantly less time. One of the main concerns with our cities are the waste management which impacts the health and environment of our society. Since it is a customized path for waste management trucks to reduce trips leading to less population and reduction in staff. And automation of this system must be done for all the homes, offices, industries, public and private properties. The garbage bins are built with the sensory module that is the ultrasonic sensors, that continuously monitors the best possible levels of garbage monitoring system. Any moment the garbage level passes over the critical level/red line that crosses the limits that is usually written in the code. The system then generates the notification to the monitoring panel(admin panel/garbage cleaning team/mobile application) so that they can collect the waste from the bins, which also enables you to save the fuel, fleet and labor maintenance costs. Today there are various manual way the municipalities are looking for the checks through the bins, which is less effective and time consuming. The basic drawback of the today's practices are the people or the maintenance panel doesn't know when to pick up the wastes from the dustbins and dump them at the correct time.
IOT based garbage monitoring system is very effective in it's way which will help in keeping the cities clean. The concern is not just about keeping the cities clean, but also reducing the man work for the cleanliness concepts in the areas, dump yards, factories. The solution also optimizes the waste collection routes and schedules based on real time and historical data. The predictive analysis of the data is required for the better decision making. The decision making must be so accurate based on the waste bin allocations.

II. LITERATURE SURVEY

The authors [1] Neha Shinde and Sayli Bhambre, is to use

IOT technology (electronics and application) to improve the present urban waste management situation and enable two-way communication between the infrastructure and the operators/administrators. In the suggested system, there are several trash cans scattered across the city or on the campus. Each trash can has a low-cost embedded device that tracks the level of the trash cans and a distinctive ID that makes it simple to determine which trash can is full. The gadget will broadcast the level and the supplied unique ID when the level hits the threshold limit,the level and the supplied unique ID will be sent by the device. The concerned authorities may view these facts online from their location and take fast action to clean the trash cans.

The authors [2] Sayali Suryakant Chalke and Mohini Bhalero . Information concerning garbage container filling is handled automatically by the system during the creation of an ideal route in order to solve optimization problems. When the garbage cans are close to overflow, a GSM module is utilised to connect with the server room, and an alert will be delivered. The position of the trash cans can be determined with the aid of the GPS module. The coordinate location of the trash container, which will be given by the GPS module, will also be included in the warning signal. This system had a dashboard, an Android app for tracking rubbish, and it also gave the driver the best route for collecting waste.

The authors [3] Prajakta More and Shelkikar R.P have suggested that a new system is required to dispose of trash appropriately. By offering an IOT-based solution, the tracking, gathering, and management processes may be watched over. LoRa technology is one method for ensuring the efficiency and dependability of the system. Compared to Wi-Fi or Bluetooth, LoRa technology is utilised for long-distance data transfer. Here, data from the trash can is collected by sensors and transmitted to the gateway using LoRa Technology. With MQTT, the data from the gateway is gathered and stored in the cloud over the Internet. The functioning of the suggested system design takes into account the initial level of solid waste segregation. By automatically recognising filled rubbish in the bin and sending a message to clear the garbage, RFID is a technology that is used for validating and identifying the process that aids the garbage alert system.

The authors [4], Minhaz Uddin Sohag and Amit Kumer Podder created an IOT-based system that uses garbage bin status to inform the user and the relevant authorities of the level. The identity system, automatic lid system, micro-controller, display system, and communication system are all coordinated by an integrated Arduino programme. On the front side of the trash can is an ultrasonic sensor. The ultrasonic sensor's transmitter generates an ultrasonic sound that is audible to humans, and the receiver picks up the sound waves that are reflected off of solid things. For the smart waste management system, a prototype of a smart trash can is being created. An identification system, an automatic lid system, a display system, and a communication system are all included in the smart bin. It can also interact with the waste management authority. The Arduino board is utilised as a microcontroller and has a programme written on it to automatically operate the entire system. This document has previously detailed the bin's whole structure and operational process.

The authors [5] Innu Sosunova and Jari Porras Eventually, more cooperation between public and private parties will be necessary to effectively improve trash management. Using GPS technology to map the current garbage collection truck routes and identify the places where the collection is not being done. Newly optimised routes are created based on inputs such as geography, demand from locals, frequency, and traffic conditions. Blockchain technology may be the foundation of SWM systems. Blockchain technology uses public key cryptography systems and cryptographic hash functions to assure the decentralisation and security of transactions. SWM systems that determine the individual cost of waste management frequently employ the pay-as-you-throw usage-pricing model, in which users are paid a fee depending on the amount of garbage they produce.

The authors [6] Shahensha Shaik, Ashwani Singla, Harshita Chugh, and Dushyant Singh the suggested approach seeks to monitor whether the bin is full or not. It will compute the sensor levels in the bin and send data to a database every second. When a user is detected by the first sensor, the second sensor will calculate the levels further. If sensor-1 detects a user, the status of the flag is sent to the other sensor. If the levels are met, the motor will turn on and the bin will be open. If the bin is full, the motor will turn off and it will search for another empty bin nearby. As a result, a led will tell the user whether to turn left or right. Microcontrollers (8051, AVR, Arduino, etc.) and Microprocessors are two types of devices that can be used in computing (RaspberryPi) Both utilising and programming a device employing embedded C programming for microcontrollers and Python programming for processors, such as a raspberry pi, will rely on the user's requirements.

The authors [7] Murugaanandam S, Ganapathy V, and Balaji R evaluates the condition of the smart bin and determines whether it is full or empty to tailor the garbage pickup schedule. In turn, it informs the authorities, saving time and money while doing so. The level of the smart dustbin is examined in a real-time waste management system to determine whether or not it is full. The relevant authorities may use this system from anywhere and at any time to get information about the state of the trash cans. Each dustbin's status will be sent to the appropriate authority. Hence, only when it is necessary can the rubbish collection truck be deployed. The Arduino UNO's Ethernet modem is used by the Sensor node to communicate readings and Sensor statuses as well as detect bin fullness. As well features a feature that locks the trash can door when it is full and during wet weather. The hardware parts listed below are

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secured to the container. The level of the dust bin is checked using an ultrasonic sensor. It may also communicate information to the nearest corporation office, updating the status of the bin. In order to find out the status at the workplace, a useful HTML-based webpage is employed. It operates by delivering a sound wave, which is then returned from the opposite end.

The authors [8] Tulsiram Reddy, Shivashankar Kb, and Rahul M Govin . It mostly explains how iot may be used to keep the waste in metropolitan areas under control for a clean environment. IoT technology based on the Arduino UNO microcontroller is employed. It primarily discusses how garbage waste can be managed using various types of sensors. Ultrasonic sensors are primarily used for garbage level detection, and if garbage overflows, the system alerts the user. This project is special in that it makes use of rain sensors, which have water sensors embedded in them, making it simple to detect rain and wet waste.

The authors [9] Dr. N. Sathish Kumar, B.Vijayalakshmi, R. Jeniferprarthana, A .Shankar ,tells us about This explanation puts forward an electronic monitoring system that incorporates web-based software, an embedded system, and RFID and IoT technologies. The application of ubiquitous computer technology, including Radio Frequency Identification (RFID) and sensor networks, opens up a new avenue for improving waste management systems. In the modern day, radio-frequency identification (RFID) technology is becoming increasingly useful in a variety of application areas, including logistics, inventory, public transit, and security. In essence, RFID offers a wonderful technique to read digital information from one or more items using a reader placed close to the objects. This therefore makes it possible for attributes to be automatically identified, tracked, checked, etc.A reader and one or more tags are the components of an RFID system. For communication to take place, RFID tags and readers must be tuned to the same frequency. Although RFID systems employ a variety of frequencies, low, high, and ultra-high frequencies are the most often used. Low frequency ranges from 125 KHz to 13.56 MHz, while high frequency ranges from 860 to 960 MHz for ultra-high frequency. There are other uses for the 2.45 GHz microwave frequency as well. As radio waves operate differently at different frequencies, it is crucial to select the appropriate frequency for a given application.

The authors [10] Mohammadhossein Ghahramani, MengChu Zhou ,Anna Molter, and Francesco Pilla, tells us about Today, big cities worldwide face various waste management challenges due to rapid growth in population and consumption.

Generally speaking, waste management consists of different procedures, such as garbage collection, transport, processing, waste disposal, and monitoring, Data can be processed and stored using these technologies practically everywhere. The suggested IoT-based approach is built on a combination of GA and an ANN. By including ANN in the model, the related cost of the model is computed. GA typically includes several stages, including parent selection, crossover, mutation, and population creation. In this work, we present a model for IoT-based rubbish collection that is optimized and incorporates intelligent vehicle routing techniques along with geographical limitations.

Study carried out on Related Work

The study of the existing systems with respect to the proposed system is carried out referring to the paper mentioned below.

Sl.No	Paper Title	Techniques used	Application
1.	A Survey on Garbage Collection and Monitoring System for Smart cities using IOT	IR sensor for garbage level detection in the bins	This system assures the cleaning of dustbins soon when the garbage level reaches its maximum.
2.	A Survey on IOT Based Smart Garbage Monitoring System	GSM module is utilized for the warning/alarm signal.	Android app for the tracking and notification to the driver ,and choosing the best route.
3.	A Survey on Garbage Monitoring using IOT	LoRa technology is been used to Collect the trash from the bins.	RFID is been used for the validation and identification of the garbage bins
4.	Smart garbage management system for a sustainable urban life.	Arduino is been used for the display, automatic lid system by integrating the specific program.	It helps in describing the bins entire structure and the level of garbage in the bin.

III. METHODOLOGY

We will attempt to create an Internet of Things (IOT)-based system that will automatically alert users and maintain regular rubbish cleaning. Every single individual in the globe puts trash in the trash can, and when it is full, they empty it. This is how a typical trashcan is utilized in its most basic form—manually, without the use of any components or scripting. The amount of waste management is based on the accuracy specified through the pseudo code since the maintenance of the bin is also not suitable whenever the dustbin is full. Thus, in this technique, a notice is delivered to the user whenever the bin is billed. The suggested method will produce an IOT-based trash can. The current system works by sending a notice when the trash can is full. If waste is not properly disposed of, the air will become unclean, and dangerous diseases can spread very quickly. The suggested plan will deal with many of these issues.

- Step 1: HTML and JavaScript along with bootstrap can be used for the creation of web pages.
- Step 2: SQL data base can be used for storing the relative information of the project.
- Step 3: Using the embedded system tools such as

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Arudino, ultrasonic sensors, wireless modem, Led's etc.

- Step 4: IoT ultrasonic sensor is used for the collection of real time data from the bins, and they are placed in such a distance between the trash and the sensor is measured for identification of the level of the wastes filled in the bins.

IV. PROPOSED SYSTEM

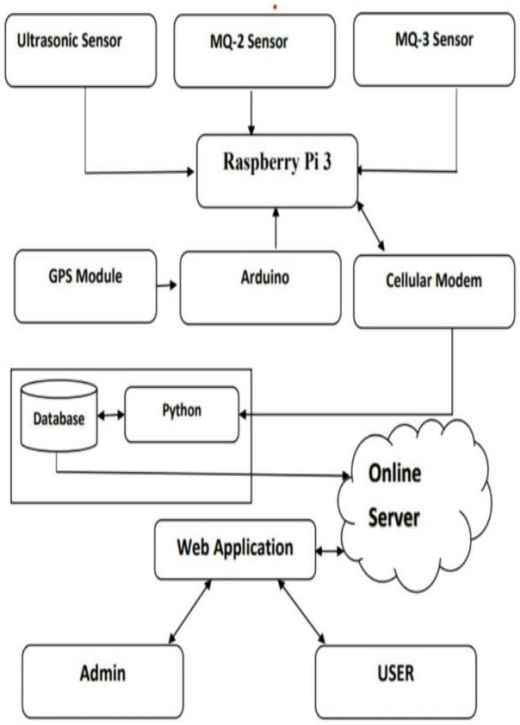
There are basically three sensors connected with the Raspberry Pi model in the system design shown above. The cellular modem will help you in connection to the internet and connectivity of the device. Through this the Mobile application will get the notifications for the panel admin and the user.

The user interface design of the proposed system is depicted in figure,

USER INTERFACE DESIGN

The GPS stands for Global Positioning System, in the proposed system GPS is used to keep track of the location of the smart bin. The high-level design involves the fetching of data to the database and replying the same into the mobile data or mobile application. The web application mainly involves the GPS, which helps in finding the real time data and information for the end users.

The user interface design of the proposed system is depicted.



V. CONCLUSION

Today most of the cities need an effective way to segregate the waste as possible so that the cleanliness is maintained throughout their surrounding bins. The two main factors contributing to pollution are the rapid growth of the population and the expansion of industry. Extreme health risks for the community are posed by trash left in the streets and overflowing dustbins. These issues can be solved by utilising technological advancement. A bin notifies the collecting truck for cleaning when it exceeds its threshold limit, saving time, money, and energy. The Arudino is convenient since it prevents bin overflow. It is helpful for IoT-based smart cities, which serve to maintain a healthy environment for both society and the populace. This initiative was started to support the idea of smart cities and create a clean India.

VI. FUTURE WORK

Future system upgrades may include several sensors, if they were practical at the time. As technology progresses, additional sensors might also be added to the system to satisfy demands. It is possible to create smart phone applications that are easier to use, more effective, and more user-friendly. Future system upgrades may include several sensors, if they were practical at the time. As technology progresses, additional sensors might also be added to the system to satisfy demands. It is possible to create smart phone applications that are easier to use, more

effective, and more user-friendly.

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