

TRASH CAN MONITORING SYSTEM

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Abstract - As the population is increasing day by day, the environment should be clean and hygienic. In many of the cities the overflowing garbage bins are creating an unhygienic environment. This further leads to arise of different types of diseases. To cope up with the situation, Shree Narendra Modi, PM of India has presented a unique example of a way to achieve cleanliness by launching a campaign. IoT plays a major role in the transformation of India into a digital economy. It acts as the catalyst that empowers our citizens by providing them with transparent governance and services (education, health, legal, financial and safety) at their fingertips. To achieve the objective of Swachh Bharat Abhiyan (Clean India Mission) in which every individual irrespective posts and authority, has to maintain clean surrounding, it is almost impossible to maintain such an environment in such a contemporary world. To overcome these situations, we are implementing Trash Can Monitoring System, which will alert the municipal corporation higher authorities about the current level of garbage in different zones of cities. Before the level reaches its maximum the alert is sent to the municipal corporation's rag picking truck, that will reach to that dustbin and will empty the bin. Hence the bins are emptied before the garbage starts over flowing or before foul smell arises. It also helps in deciding optimized waste collection routes and ultimately reduce the fuel consumption enabling them to plan their weekly/daily schedule.

Key Words: IOT, Arduino Micro controller, Sensors, Webpage.

INTRODUCTION

The objective of "Digital India Program" of the Government is to on providing high speed internet services to its citizens and make services available in real time for both online and mobile platform. The Internet of Things (IoT) shall be able to incorporate a large number of heterogeneous end systems and sensor based circuitry. It will play a major role in the transformation of India into a digital economy - as the catalyst that empowers our citizens by providing them with transparent governance and services (education, health, legal, financial and safety) at their fingertips. Trash can monitoring system which involves monitoring Garbage Bins throughout city and also appropriate disposal of those wastes when needed. Now-a-days we are experiencing the problem of garbage bins which getting accumulated in both urban and rural areas. There is no proper supervision system for Corporation towards monitoring the activity of Garbage collection. Mostly whenever people see any vacant plot, they tend to throw the

wastes once the garbage bin in their locality is not emptied, as no one is there to manage them immediately. This obviously increases as days goes leading to health issues, unclean city and also spreads diseases during rainy season.

To accommodate this new demand on cities, municipalities are turning to the Internet of Things innovation to enhance their services, reduce costs, and improve communication and interaction. Though usage of IOT, there is an efficient way to improve nearly every aspect of living. It creates new experience for the residents, and makes day-to-day living much more comfortable, easier and secure.

With the upcoming Internet of Things (IOT) Technology and digital India initiative going hand in hand we can take simple steps on developing an "IOT based Trash Management System" prototype which will help the people and the society as a whole, in proper waste management. We have designed Municipal Corporation-facing portals, providing with real-time access to information about the Trash cans in and around the cities. This time to time collection and deposition of the waste and garbage which will help in making clean, thus achieving the SWACHH BHARAT motto. In addition, this system is developed for easy handling, supervision and monitoring of garbage in the societies thus saving a lot of time, fuel too. When implemented nationwide results in rapid growth of the country's standard of living, making the living space a better one for its citizens.

1. RELATED WORKS:

This system helps in keeping the cities cleaner as it continuously monitors the garbage bins levels and informs about garbage collected in the garbage bins across the city via a web page.[1] The web page gives a graphical view of the garbage bins and highlights the garbage collected in color to the user monitoring it. Further, this system uses ultrasonic sensors placed over the bins to detect the garbage level and compare it with the garbage bins depth. Also it uses Arduino microcontroller, LCD screen, Wi-Fi modem for sending data and a buzzer and powered by a 12V transformer. The LCD screen is used to display the level of garbage collected in the bins. The system puts on the buzzer when the level of garbage collected exceeds the threshold limit. The ESP8266 Wi-Fi Module can give any microcontroller access to your Wi-Fi network. It is an extremely cost effective board.

In metropolitan cities the municipal authority collects the wastes from the garbage, depending upon the population and sometimes garbage bin may or may not be full. This system reduces the traffic in the city by informing the current status of each and every garbage bins thus avoiding the overflowing and stinking of wastes.[2]IoT based smart waste clean management checks the waste level over the dustbin by using sensor systems. It is a network of dustbins which integrates the idea of IoT with wireless sensor network. Once it detects, immediately system alerts the authorized through GSM/GPRS. Manages the waste in different type of box by using automation by detecting the wet and dry waste and separating this kind of waste automatically, thus reducing a lot of time and man power

It implements an enhanced way of waste management using smart sensors to gather fill-level data, presence of wastes inside the dustbin and stinking condition from these containers and garbage bins, and send it to servers in real time.[3] It uses ultrasonic range sensor to know the amount of garbage collected and this data is sent through GSM/GPRS 900A module to Authorized phone number present at waste management centers and show fill-levels of each garbage bin in real-time on phone screen.. This operation is controlled by ATmega328P micro controller. Also, the ultra-sonic sensor which is fixed at the dustbin senses if any garbage is thrown on street instead of dustbin and then siren is made to ring even if the dustbin is not filled it may start stinking due to the wet waste present in the dustbin. To prevent this moisture sensor is fixed at the dustbin, that senses the moisture content in the waste and notifies if the moisture content is more than a particle threshold level. Once this SMS is received, the dustbin is addressed even if it is not full.

Real time waste management system uses ultrasonic sensor as input which is placed at the maximum level of the garbage bin.[4]It will compare the depth of the dustbin to show the level of garbage in the bin. An ARM microcontroller is used, which controls system operation .Everything will be connected to Thing Speak. Also the percentage of garbage will be displayed on LCD to allow user to know the level of garbage in the dustbin without open it. Four ultrasonic sensors are connected to ARM microcontroller to detect the level of garbage of each bin based on the depth of the bin. At the same, these four ultrasonic sensors connected to ESP8266 Wi-Fi module, which give any microcontroller access own network Wi-Fi for data transfer and display on Think Speak. The data collected is then sent to Think Speak to analyze and visualize uploaded data, in real time. Thus, the information of the dustbin can be accessed from anywhere and anytime and waste management can send the garbage collector to pick up the garbage when the dustbin is full.

Dustbins are interfaced with microcontroller based system having sensor systems along with central system showing current status of dustbin on mobile web browser.

[5]It will tell us whether the trash can is empty or full through the web server, from anywhere in the world over the Internet and send E-Mail to municipality. Hence the status level will be updated on and displayed to the HTML page. Majority part of the project depends upon the working of the Wi-Fi module. The main aim is to reduce human resources and efforts along with the enhancement of a smart city vision.

Smart bin is built on a microcontroller Arduino Uno board and is interfaced with GSM modem and Ultrasonic sensor. [6]It is placed at the top of the dustbin which will measure the stature of wastes in it. Arduino will be programmed in such a way that when the dustbin is about to get filled, the remaining height from the threshold height will be displayed immediately. Once the garbage reaches the maximum threshold level, ultrasonic sensor will trigger the GSM modem to send messages ,which continuously alerts the required authority until the garbage in the dustbin is collected. Once the dustbin is cleared or emptied, people can reuse the dustbin. Once these smart bins are implemented on a large scale, waste can be managed efficiently.

IOT Based Waste Monitoring uses, the garbage bins that are connected to the zigbee to get the real time information of the garbage bins. [7]These garbage bins are interfaced with micro controller based system with IR Sensors and RF modules. The IR sensors will show us the various levels of garbage in the dustbins and also the weight sensor gets activated to send its output ahead when its threshold level is 100% full and sends the signals to microcontroller . These signals are encoded and sent to zigbee transmitter which will be sent to the USB receiver of the zigbee. At the receiver section a Zigbee USB connected to the laptop or pc where all information is displayed and also recorded by visual basic programming.

Smart Dustbin uses GSM 900A modem to send the messages. [8]The ultrasonic sensor is used to find the level of garbage, filled from time to time. However, three sensors can be employed at various heights like $h/3$, $2h/3$ and h , where h is the height of the bin but to make it affordable and to achieve the same results, only one sensor is placed at surface level. Arduino Uno board is used as microcontroller platform. Threshold distance is the difference in height at which sensor is placed and the level of garbage fill and it is set at 10 cm. During the course of garbage accumulation, whenever the difference falls below threshold value, alert SMS to the concerned authority is sent.

2. SYSTEM ARCHITECTURE

The IOT based Trash Can Monitoring system is a very effective and helpful system which will help to monitor and keep the cities clean. It monitors and informs about the level of garbage collected in the trash cans via a web page. For this the system uses ultrasonic and infrared sensors placed over the bins to detect the garbage level and compare

it with the trash cans depth. This system makes use of Arduino family microcontroller, LCD screen (if needed), Wi-Fi modem for sending data. The LCD screen is used to display the status of the level of garbage collected in the bins. Whereas a web page is built to show the level of wastes in the bins to the user monitoring it. The web page gives a tabular format view of the trash can levels (low, medium or high) and amount of bio-gas detected in the collected garbage. It helps in time to time monitoring of the bins in and around the city at a time. Therefore, it gives immediate information to the authority, for collecting of garbage in time, before it overflows and also before the foul smell arises due to the organic matter present in it. Thus this system helps to keep the city clean by informing about the garbage levels of the bins via a web page. The ESP8266 Wi-Fi Module is an extremely cost effective board and self-contained SOC. It is integrated TCP/IP protocol stack that is capable of offloading all Wi-Fi networking functions from another application processor.

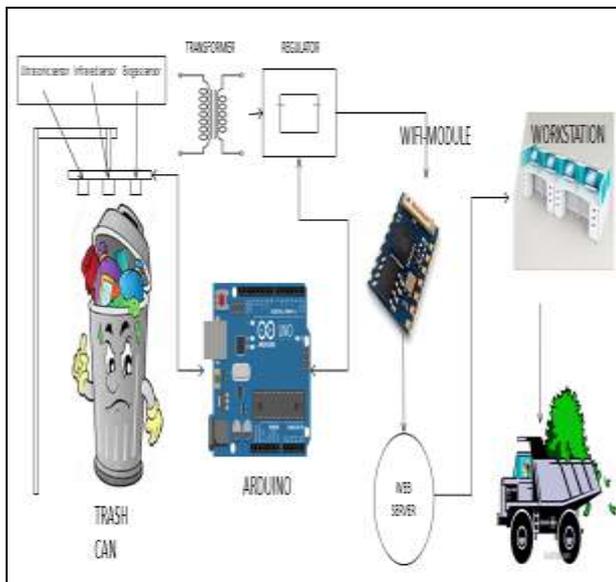
B. ULTRASONIC SENSOR:

The Ultrasonic sensor is used to measure the distance with high stability and accuracy. It can measure distance from 2cm to 400cm. It emits an ultrasound wave at the frequency of 40 KHz in the air and if an object will come by its way then it will bounce back to the sensor. Thus, by using that time which it takes to strike the object and comes back, it can calculate the distance between the sensor and the wastes.



BIOGAS SENSOR:

Bio gas is a combustible gaseous fuel that is collected from the microbial degradation of organic matter in anaerobic conditions. These gases are detected by the bio-gas sensor when the foul smell arises due to the degradation of wastes and intimates it immediately for clearance, even if the threshold conditions are not reached in the level of wastes.



3. HARDWARE USED:

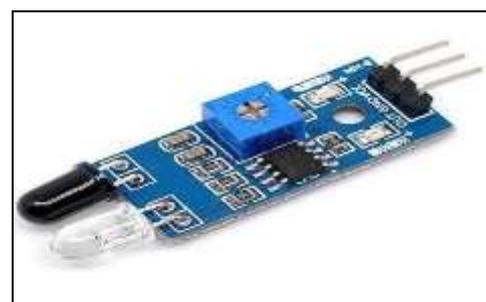
A. ARDUINO MICROCONTROLLER

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs- light on a sensor, a finger on a button and here the level of wastes in the bin - and turn it into an output such as publishing something online.



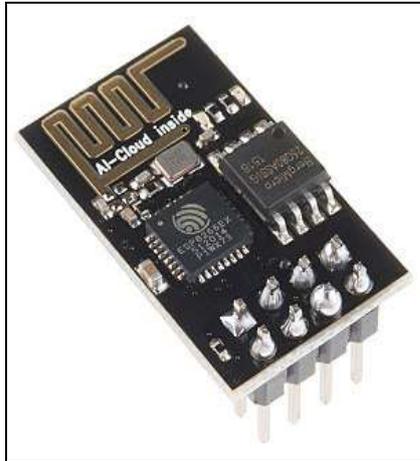
C. INFRARED SENSOR:

Infrared Sensor which is also called the Obstacle detector, transmits the infrared signal that bounces when it reaches the surface of an object and the signal is received back at the infrared receiver. In our system, we use it to detect the presence of wastes in the garbage bin.

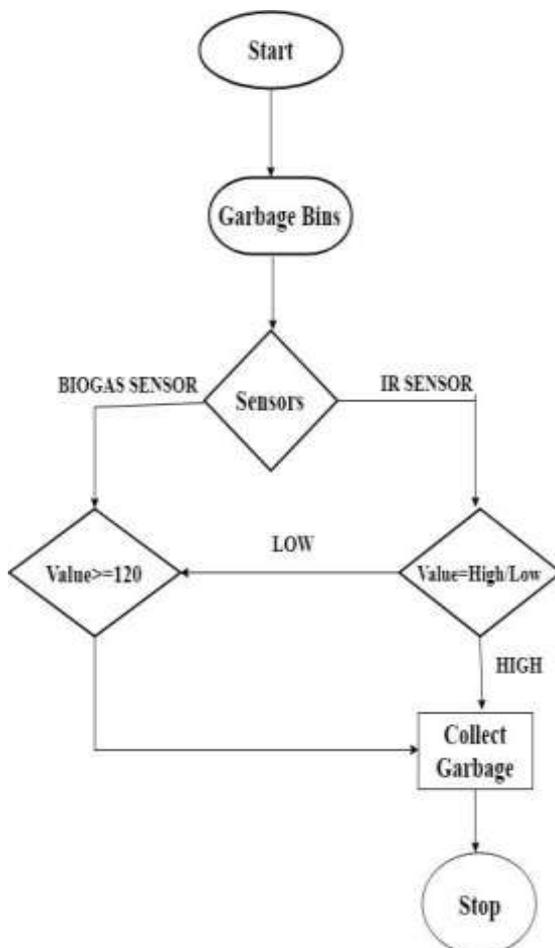


E. ESP8266 WI-FI MODULE:

ESP8266 is a Wi-Fi module which will give your projects **access to Wi-Fi or internet**. In spite of being a very cheaper device, it will make our project very powerful. It communicates with microcontroller device and makes the project wireless.



4. FLOWCHART



5. ADVANTAGES

1. Changes in the level of the trash can are monitored and this information reaches the authority time to time.
2. Embedding three different sensors produces more effective and accurate results.
3. Tracking all the bins throughout the city at a time makes this system reliable and helpful for the authorities of the municipal corporation, making the job easier for them.
4. Helps in maintaining cleaner and healthier country.

6. CONCLUSION

By implementing, this work will avoid the overflowing of garbage from the containers present throughout the metropolitan cities. The municipal authority usually collects the wastes from the garbage bin in twice or thrice within a week depending upon the population and sometimes garbage bin may not be full. Thus, this system will inform the current status of each and every garbage bins levels making the work easier and efficient. It reduces the time as well as the fuel as we can decide on an optimal route to collect the wastes, thereby saving the money. Hence it avoids the overflowing and stinking of wastes and maintains a clean and healthy environment

REFERENCES

- 1) "Smart Garbage Monitoring System using Internet of Things (IoT)", Prof. Dr. Sandeep M. Chaware¹, Shriram Dighe², Akshay Joshi³, Namrata Bajare⁴, Rohini Korke⁵, International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering ISO 3297:2007 Certified Vol. 5, Issue 1, January 2017
- 2) "Internet of Things [IoT] Based Smart Garbage Monitoring and Clearance System", Janaki.S, Nanthini.N, Yamini.S, International Journal of Pure and Applied Mathematics Volume 118 No. 20 2018, 2953-2960
- 3) "Smart Bin: Internet-of-Things Garbage Monitoring System", Mustafa M.R1, and KuAzir K.N.F1*, MATEC Web of Conferences 140, 01030 (2017) ICEESI 2017
- 4) "Smart waste management system", Shyamala S.C, Kunjan Sindhe, Vishwanth Muddy, Chitra C N, ISSN: 2455-2631 September 2016 IJSDR | Volume 1, Issue 9

- 5) "SMART DUSTBIN FOR ECONOMIC GROWTH ", U. NAGARAJU RITU MISHRA , Chaitanya Kumar , Rajkumar
- 6) "Smart Dustbin-An Efficient Garbage Monitoring System Monika K A1, Nikitha Rao2, Prapulla S B3, Shobha G4 ,DOI 10.4010/2016.1694 ISSN 2321 3361 © 2016 IJESC
- 7) "IOT Based Waste Monitoring For Smart City ", Shambala S Salunkhe, Madura D Yadav,Vrushali V Kulkarni ,International Journal Of Engineering And Computer Science ISSN:2319-7242 Volume 6 Issue 4 April 2017
- 8) "DUSTBIN MANAGEMENT SYSTEM USING IOT ",Minthu Ram Chiary, Sripathi SaiCharan, Abdul Rashath .R, Dhikhi .T ,International Journal of Pure and Applied Mathematics Volume 115 No. 8 2017, 463-468