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IoT Based Garbage Monitoring System

Geeta Chavan¹, Shruti Patil², Ashwini Gaikwad³, Amruta Umardand⁴, Sayali Shinde⁵

^{1, 2, 3, 4, 5} (Computer Science & Engineering, Daulatrao Aher College of Engineering, Karad)

Abstract: “A clean India would be the best honor India could pay to Mahatma Gandhi on his 150 birth anniversary in 2019”. The Prime Minister insisted people fulfil Mahatma Gandhi’s dream of a clean and hygienic India so that they launched ‘Swachh Bharat Abhiyan’. To contribute the Narendra Modi’s dream we have implemented one system which is based on recent technology Internet of Things. Using this technology we can solve a waste management problem.

This paper introduced “IoT Based Smart Dustbin for Smart Cities”. In this proposed System dustbins which are located across cities are provided with low cost embedded device. The main theme of the work is to develop a smart intelligent garbage alert system for a proper garbage management. This system recommended a smart alert for dust clearance by giving an alert signal to the worker’s mobile whose collect the garbage for instant cleaning of dustbin with proper verification based on the level of garbage filling. This process is facilitated by the ultrasonic sensor which is consolidated with Arduino UNO to check the level of garbage filled in the dustbin and sends the alert to the garbage collector if garbage is filled. The System also build up the smart garbage alert system by providing automatic identification of garbage filled in the dustbin and sends the status of clean-up to the municipal authority confirming that the work is done.

Keywords: Ultrasonic Sensor, Iot, Arduino UNO microcontroller, Android Application.

I. INTRODUCTION

Overflowing dustbins are the big problem in developing countries. With the increase in population, the scenario of cleanliness with respect to waste management is humiliating tremendously. Nowadays, we see the garbage bins placed at the boundaries of the cities or public place or roadsides and they are always overflowing and all the garbage spills out resulting in pollution. No one takes action to inform municipal authority about cleaning the dustbins. Hence this project all about collecting the garbage from boundaries of the cities or public place or roadsides. This project is proposed to keep the cities clean. A big Challenge in the urban cities is Solid waste management, not only in India but most of the countries in the world.

.IoT and Arduino UNO microcontroller are the latest trends and are one of the best combinations to be used in the project. Hence, a combination of both these technologies is used in the project. Inefficient waste collection systems lead to environmental pollution, which in turn results in the breeding of insects, animal’s scavengers, and rodents, and giving rise to the range of diseases. The traditional method includes burning of the waste if not collected in time. In this proposed System dustbins which located in throughout cities are provided with low cost embedded device. The main thought of developing a smart alert system for a proper garbage management. This system recommended smart alert for dust clearance by giving an alert signal to the worker’s mobile whose collect the garbage for instant cleaning of dustbin with proper verification based on the level of garbage filling. This process is facilitated by the ultrasonic sensor which is consolidated with Arduino UNO to check the level of garbage filled in the dustbin and sends the alert to the garbage collector if garbage is filled. The System also build up the smart garbage alert system by providing automatic identification of garbage filled in the dustbin and sends the status of clean-up to the municipal authority confirming that the work is done. To give the brief description, ultrasonic sensors are used which is placed at the top of the dustbin. Arduino UNO microcontroller is connected to the ultrasonic sensor. Arduino UNO microcontroller is popular because of the inbuilt pins are available directly we don’t need external connection. C code is burned in the microprocessor of Arduino board, that contains the variable and predefined function for measuring the level of dust. When dust comes nearest to the sensor that time dustbin full message sends to the municipal authority with the location of dustbin through the google map. This message sends through the wifi module which is connected to the Arduino board. When admin gets the message that message forward to the garbage collector with location. after receiving the message garbage collector collects the garbage and cleaning acknowledgment send to the admin automatically.

II. RELATED WORK

N.S.Kumar describes a paper “IOT based smart garbage alert system using Arduino UNO”[1]the Waste management is one of the primary problems that the world faces irrespective of the case of developed or developing country. The key issue in the waste

management is that the garbage bin at public places gets overflowed well in advance before the commencement of the next cleaning process. It, in turn, leads to various hazards such as bad odor & ugliness to that place which may be the root cause for the spread of various diseases. To avoid all such hazardous scenario and maintain public cleanliness and health this work is mounted on a smart garbage system. The main thought to develop an alert system for a proper garbage management. This paper proposes a smart alert system for garbage clearance by giving an alert signal to the municipal web server for instant cleaning of dustbin with proper verification based on a level of garbage filling.

P.R. Naregalkar proposed "IOT Based Smart Garbage Monitoring System"[2]. This paper describes, all the equipment's we use in our day to day life can be controlled and monitored using the IoT. A majority of the process is done with the help of sensors in IoT. Sensors are deployed everywhere and these sensors convert raw physical data into digital signals and transmit them to its control center. By this way, we can monitor environmental changes remotely from any part of the world via the internet. These systems architecture would be based on a context of operations and processes in real-time scenarios.

SS Navghane proposed "IoT Based Smart Garbage and Waste Collection Bin" [3] many times, in our city we see that the garbage bins or dustbins placed at public places are overloaded. It creates unhygienic conditions for people as well as ugliness to that place leaving a bad smell. To avoid all such situations we are going to implement a project called IoT Based Smart Garbage and Waste Collection Bins. These bins are integrated with microcontroller based system along with the central system to display the current status of waste, on a mobile browser with HTML page by Wi-Fi. Hence the status will be updated on to the HTML page. A major part of our project depends upon the working of the Wi-Fi module; essential for its implementation. The main purpose of this system is to reduce human power and efforts along with the enhancement of a smart city view.

In the paper "City Garbage collection indicator using RF (Zigbee) and GSM technology"[4], they describe City Garbage collection indicator using RF(Zigbee) and GSM technology. In our city many times we see that the garbage bins located at public places are overflowing. It creates unhygienic conditions for people. Also, it creates ugliness to that place. At that time, the bad smell is also span. To avoid all such situations we are going to implement a project called City Garbage collection indicator using RF and GSM technology. In this dustbin are interfaced with microcontroller based system having IR wireless system. These Dustbins are integrated with the centric System for showing the status of waste in bins on GUI. IF the dustbin is loaded with garbage the status will display on a screen. If the dustbin is not cleaned at the specific time then SMS will be sent to the person informing that dustbin are not cleaned yet. At the same status report will be updated so that the sweeper for contractor responsible for the cleanliness can be questioned for the delay. Hence an automatic system can be designed to maintain the city Clean with the help of electronics. We have observed that the municipal officer or the government authorized person will monitor the status of the dustbin. generally, we see that they have a daily schedule of picking up these garbage bins. This schedule varies as per the population of that place. It can be once in a day or twice in a day or in some cases once in two days. However, we see that in case there is some function, lots of garbage generated by people. In such situation the garbage dustbin gets instantly full and then it overflows which creates many problems. In this situations, with help of our system the government authority person can get alert quickly. So they will get the alert before their periodic season of cleaning the dustbin. Then they can go and pick up the dustbins.

III. PROBLEM DEFINITION

To reduce unhygienic condition formed in the surrounding, at the same time bad smell spread out due to waste, and to some harmful diseases around a locality which is easily spreadable. Solving these daily problems of waste management by using a recent technology i.e Internet of Things.

IV. EXISTING SYSTEM



Fig1: Existing System

Nowadays traditional method is used to collect garbage but the drawback of this method is, sometimes the municipality worker does not know the present status of the dustbin. Some time dustbins are overflowing due to this unhygienic condition formed so bad smell spread out in the surrounding. The traditional method includes burning of the waste if not collected in time.

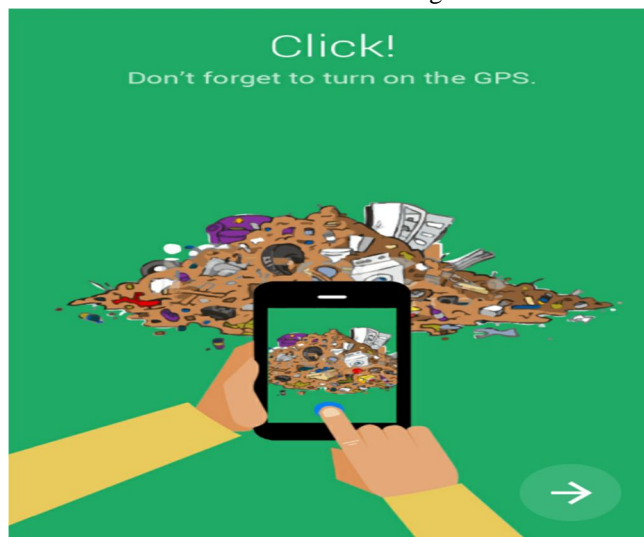


Fig2:Existing System

Recently one application developed to proper waste management is “Swachhata APP”. In that all you need to do is click a picture of the dust dump or overflowing garbage bins and post it on the Swachhata App. This app launched by Union urban development (UD) ministry for addressing complaints related to civic issues. But the App, has limited scope for interaction with officials. This is a problem for several residents. Near by, 2.30 lakh sanitation and garbage-related complaints are registered every month on the 'Swachhata App'. But still not all the residential area cleaned perfectly

V. PROPOSED SYSTEM ARCHITECTURE

A. System overview

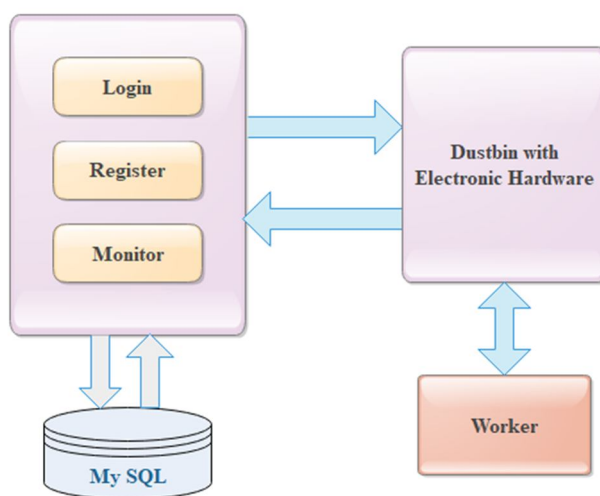


Fig3: System Architecture

Ultrasonic sensors are used which is placed at the top of the dustbin. Arduino UNO microcontroller is connected to the ultrasonic sensor. Arduino UNO microcontroller is popular because of the inbuilt pins are available directly we don't need external connection. C code is burned in the microprocessor of Arduino board, that contains the variable and predefined function for measuring the level of dust. When dust comes nearest to the sensor that time dustbin full message sends to the municipal authority

with the location of dustbin through the google map. This message sends through the wifi module which is connected to the Arduino board. When admin gets the message that message forward to the garbage collector with location. after receiving the message garbage collector collects the garbage and cleaning acknowledgment send to the admin automatically.

VI. MODULES USED

A. Admin Module

First Admin access the system using login id and password which is already given to them, he is always in an active state. when dustbin crosses the level then that signal send to the Admin through Wi-Fi module which is connected to Arduino board. Received signal and location of dustbin can be forwarded to the garbage collector by the admin to the grabage collector. Admin also monitors status of dustbin .After filling 25%,50%,75% and finally 100% of the dust in the dustbin this status send to the admin.After cleaning the dustbin 0% status send to admin from this notification admin know the dustbin clean by the garbage collector.

B. Worker Module

After receiving the message from the worker, garbage collector takes appropriate action and collects the garbage within time and acknowledgment send automatically that is dustbin cleaned. If the new worker joined first he has to register the system and then access the system. Also, the worker gets the status of dustbin when the dustbin filling 25%,50 %, 75% or 100%.Whenever dustbin is full 100%, the worker gets signal about the status of the dustbin.

C. Ultrasonic Sensor

When the ultrasonic sensor sends and receives the signal then they called transceivers. Generally, the ultrasonic sensor is known as transducers. ultrasonic sensor work same as radar and sonar working principle which estimate attributes of a target by clarifying the echoes from radio or sound waves respectively. High-frequency sound waves generated by active ultrasonic sensors and also evaluate the echo which is received back by the sensor. Passive ultrasonic sensors used for detecting the ultrasonic noise that is present under certain conditions. Example of passive ultrasonic sensor: microphones. Ultrasonic sensor sense the garbage level and appropriate status of dustbins send to the admin and worker.



Fig4:Ultrasonic Sensore

D. Arduino UNO

Arduino UNO is a microcontroller board based on ATmega328P.The board includes 14 digital input pins output pins and 6 analog inputs pin, It has frequency 16 MHz quartz crystal with USB connection, a power jack, an ICSP header and reset button. Board connected to the sensor, when the sensor senses the level of garbage then that signal send to the Arduino board.

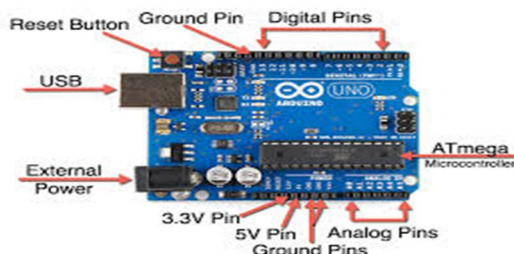


Fig5: Arduino UNO

Algorithm

VII. IMPLEMENTATION DETAILS

1. Start
2. int buzzer=10;
int trigger=4;
int echopin=5;
String sts;
int dist=0;
3. dist=(duration/2)/29.1; //Transforming the no. Into cm
Print distance
if(dist<5)
DigitalWrite(buzzer,high);
4. elseif(dist>5)
DigitalWrite(buzzer,low);
Write(sts=50%);
5. else if(dist>10)
Write(sts=25%);
6. elseif(dist>20)
Write(sts=0%);
7. Stop

VIII. SYSTEM REQUIREMENTS

IDE:

Front End

Android

Android Studio 2.2.2

JDK 1.8

Back End

Proposed database: MySQL

Embedded Device:

Arduino UNO

Arduino UNO is a microcontroller board based on ATmega328P. The board includes 14 digital input pins output pins and 6 analog inputs pin, It has frequency 16 MHz quartz crystal with USB connection, a power jack, an ICSP header and reset button. Board connected to the sensor, when the sensor senses the level of garbage then that signal send to the Arduino board.

Sensing Device:

Ultrasonic sensor

When the ultrasonic sensor sends and receives the signal then they called transceivers. Generally, the ultrasonic sensor is known as transducers. They work same as radar and sonar working principle which evaluate attributes of a target by clarifying the echoes from radio or sound waves respectively. High-frequency sound waves generated by active ultrasonic sensors and also evaluate the echo which is received back by the sensor. Passive ultrasonic sensors used for detecting the ultrasonic noise that is present under certain conditions. Example of passive ultrasonic sensor: microphones.

Wireless Communication Devices

Wi-Fi:

High data rate (54Mbit/s +) but also high power consumption. It is used when you need to connect directly to the Internet, such as an Internet-of Things device, and have an external power source.

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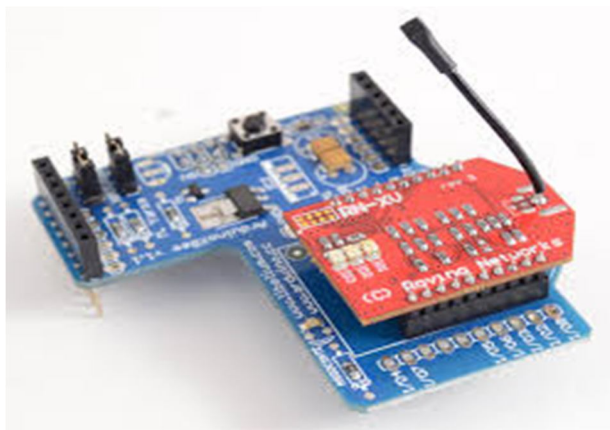


Fig6: WiFi

IX. RESULT AND DISCUSSION

Parameter	Existing System	Proposed System
Distance $\text{dist} = (\text{duration}/2)/29.1$		
dist<5		sts=100%
dist>5		sts=50%
dist>10		sts=25%
dist>20		sts=0%
Time	24 hours	60 second

Fig7:Time and Distance Comparison

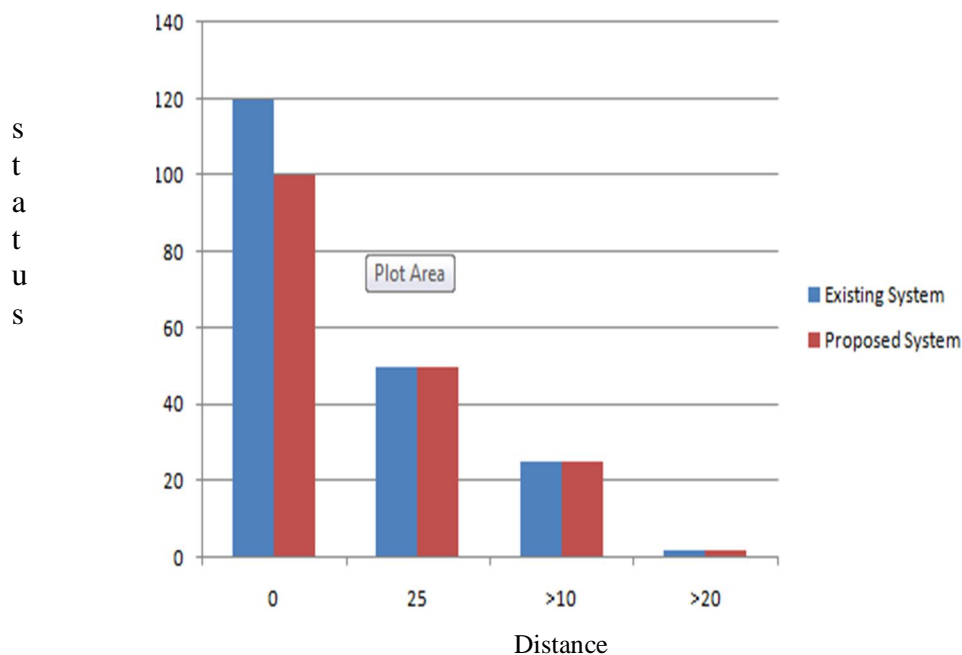


Fig8:Distance comparison of existing system and proposed system

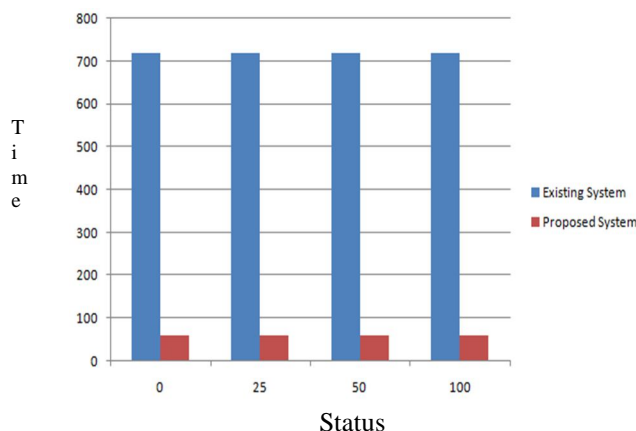


Fig9:Time comparion of exsting system and proposed system

X. CONCLUSION

The proposed method for the monitoring of garbage is an efficient and time saving process. This system can be implemented at any place with ease and within the reasonable amount of time. This proposed system would not only function for collecting and updating data automatically and timely but also it could analyze and use data intelligently.

XI. FUTURE ENHANCEMENT

For future, instead of person in the vehicle we can make use of a line follower robot which will perform automation .So this makes the system more reliable.

XII. ACKNOWLEDGEMENT

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