Smart Garbage System

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ABSTRACT: *Nowadays, the major problem our country is facing is the disposal of waste efficiently. The waste is not being treated properly which not only causes various harmful diseases but also pollutes the environment. The garbage bins kept at different places are not cleaned at proper time which causes the bins to get full and the people are then forced to leave their garbage near the garbage bins on the ground which in turn is a more big problem. The municipality is only responsible for not cleaning the garbage bins at proper time as they are not having proper systems to track the amount of waste the bins are having at a certain time so it can go and clean it up. For this problem, we are proposing a smart garbage alert system using IOT which would alert the municipality that the garbage bins are full and the cleaning process can be done at proper time. The system is equipped by a ultrasonic sensor, gas sensor, fire sensor, temperature sensor, GSM module and an IOT module which are interfaced with the Arduino Uno microcontroller. When the values recorded by the sensor reach a particular threshold value, the alert is send to the municipality and can help them to work accordingly and efficiently. The system will notify the municipality and make sure the waste collection work is being done on time and thereby help to create a cleaner and safer environment.*

Key Words: *Disinfection, Titanium dioxide Nanospray, Dentist, Nosocomial pathogen, Bacterial contamination*

I. INTRODUCTION

In this modern age, systems are connected to other systems with the help of IOT and thus helps in performing the tasks efficiently and more quickly. IOT has the potential to connect a large number of systems and hence has the potential to perform the complex tasks easily. One of the most important need for the present time is having a proper garbage monitoring system which can help in maintaining a clean and hygienic atmosphere and reduce the diseases causing due to the improper waste management. A proper system which can detect ,monitor and manage the garbage in the dustbin and reduce human efforts and time. With the advancement of IOT technology a smart garbage system can be created which can record the amount of the garbage in the garbage bins hence, everytime the garbage reaches the maximum amount it can send notification using GSM module to the municipal department of the region and the municipal department can take appropriate actions in response. The system can have other specifications like detection of fire using the fire sensor , detection of the temperature using temperature sensor ,detection of harmful gases using gas sensor etc and can contribute to provide a healthy and clean environment.

II. LITERATURE REVIEW

With the aim of creating a unique system we have reviewed papers which deal with similar concepts. Many systems like this were implemented in the past but were not so effective so a research was done to know what was the problem exactly. This research has been done.

- In paper [1], the polluted regions of Guwahati city is taken into account and studied on the basis of municipal solid waste. Various teams have been demarcated for identifying the affected areas. The waste was divided on the basis of biodegradable and non biodegradable waste and how the people dump their waste was observed.
- In paper [2], Smart cities possess a sustainable and hygienic environment for a decent quality of life . Here, garbage disposal plays a vital role. By keeping this in my mind a smart dustbin is designed to automatically alert the municipality when the dustbin gets filled.
- In paper [3], there is a usual existing process where garbage trucks are send from the municipality to collect the waste from the garbage bins. The wastes are loaded in the truck and taken to the dumping grounds. But the problem arises that there are many regions where the garbage bins get filled well before the cleaning process and the people doing the job of cleaning process are not enough to do the job.
- In paper [4], the approach for a Smart Dustbin is made which alerts the concerned authorities when

the garbage is full in the garbage bins and cleaning or emptying them is of immediate concern.

III. PROBLEM DEFINITION

People throw their household garbage in the garbage bins that are kept by the municipality at various locations near the road. These dustbins get filled up well in advance untill the municipality people come to empty the garbage bins. When the garbage bins are completely filled the people are forced to dispose their garbage near the garbage bins near the road. This gets more bad during the rainy season when the water mixes with the waste and start releasing bad odour. The main reason behind this is that the municipality is not able to work efficiently because they do not have any monitoring system that can track the garbage bins if they are full or not. So, in order to prevent the overflowing of garbage bins with waste and to make the environment clean , we are proposing a smart garbage alert system that can detect the amount of garbage in the bins and can send a sms alert notification to the municipality so that the bins can be cleaned at proper time.

IV. PROPOSED SYSTEM

In our proposed system a sensor is installed in each dustbin with a power supply unit on each . The system is supported by a ultrasonic sensor, MQ gas sensor, fire sensor ,GSM module, temperature Sensor and an IOT module which all are interfaced with the Arduino Uno microcontroller. The ultrasonic sensor is used to check the amount of garbage in the garbage bins and can also send the sms alert to the nearest municipality office with the location of the bin with the help of Arduino Uno and the GSM module. The alert will be in the form of a text message stating that the dustbin is full, along with the url link of the location of the bin which can be known by opening that link. The system is also having sensors like MQ gas sensor, temperature sensor, fire sensor. The MQ Gas Sensor will check the level of odourness near the garbage bin so that it do not smell bad, the temperature sensor will check the temperature of the garbage bin so that the waste do not catch fire in case of summers, the fire sensor will check for fire in the bin which may affect the whole system. All these sensors will send the alert notifications to the municipality office so that they can take immediate actions and do the cleaning work at that time.

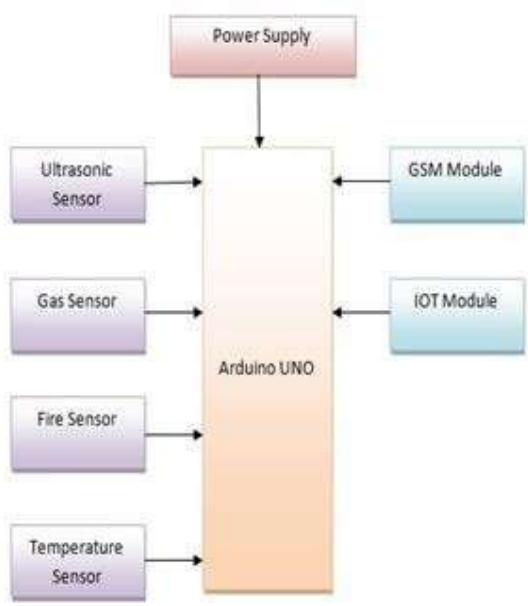

Fig. 1. Architecture

A. MQ Gas Sensor

The MQ Gas Sensor is helpful to check for the amount of harmful gases that are produced by the waste. The sensitivity of the sensor is high in gases like sulphur dioxide which produces bad odour. It can also sense flammable gases which can cause fire and can damage the garbage bins.

B. Ultrasonic Sensor

The Ultrasonic Sensor helps to check the amount of garbage in the bins by recording the level of garbage in the bin. It uses a single ultrasonic element for both sending and receiving. The element emits a ultrasonic wave, the wave hits the garbage in the bin, then gets reflected and is received back by the element.

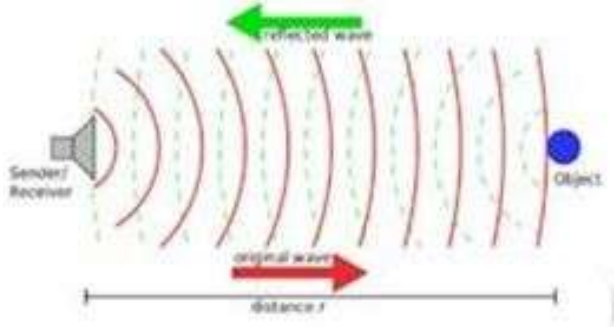

Fig. 2. Working of Ultrasonic Sensor

The formula for determining the distance is:

Distance R= 1/2 x T x S; where R is the distance, T is the time between sending and receiving the wave, and S is the speed at which sounds travel.

C. Temperature Sensor

The Temperature Sensor is used to check the temperature inside the garbage bins so that the waste do not catch fire in case of very hot summers. The temperature sensor can sense the temperature in a range of 50-150 degree celsius. It possess a low self heating capability. The output voltage is linearly proportional to the celsius temperature.

D. Fire Sensor

The Fire Sensor is used to check if any fire occurs inside the garbage bins due to the hot climatic conditions or external conditions(human being). It will immediately sense the fire and send it to the municipality with the help of Arduino Uno.

E. IOT Module

An IOT Module is a small electronic device embedded in objects, machines and things that connect to wireless networks and sends and receives data. It is used to view the data collected by the Arduino Uno in a web page.

F. Arduino Uno Microcontroller

The Arduino Uno is a microcontroller chip build on the ATmega328 . It consist of 14 digital input and output pins,out of which 6 can be used as PWM(pulse width modulation) outputs; 6 analog inputs; a 16 MHz resonator; a facilitation for USB connection; a power jack for power supply; an ICSP(in circuit serial programming) header; and a reset button for resetting the board. For starting it to work,we have to simply connect it to a computer with a USB cable or power it with an adapter(AC to DC) or battery. All the sensors present in this system are interfaced with the Arduino Uno , all the data will be controlled with the help of it. The GSM Module will send the alert notification with the help of Arduino Uno.

Fig. 3. Arduino UNO

G. GSM Module

GSM(Global System for Mobile Communication) Module is used to create communication between a computer system and a GSM-GPRS system. It has a slot for a gsm sim card in it which is used to send the alert notification, as a sms, to the municipality with the help of Arduino Uno.

Fig. 4. GSM Module

V. IMPLEMENTATION

The Smart Garbage Alert System is very useful in pre- venting the overflow of garbage. All the sensors including the ultrasonic sensor, fire sensor ,temperature sensor and gas sensor will continuously record the values and if the values reaches the threshold values, the alert notification is send to the municipality. The ultrasonic sensor will record the level of garbage in the garbage bin, reaching the highest value it will send a sms alert to the municipality stating that the garbage bin is full and they can come for the cleaning process and can empty the bin. In case of areas where the garbage bins take weeks to fill, the waste will produce harmful gases like hydrogen sulphide and gases which can give bad odour and pollute the nearby area. These problems will be tackled by the mq gas sensor which will record the amount of gases produced by the garbage, once the value exceeds the threshold value the sms alert will reach the municipality. In case of fire also the same thing will happen. The system is also having a temperature sensor which will notify the municipality if the temperature in the bin rises very much because it may cause a fire and damage the system. By this the municipality can place the dustbin in a shaded area so that it does not catch fire and damage the system.

The alert will be in the form of a sms notification and it will also consist of a location link in it which can be opened in Google Maps and the exact location of the bins can be known by the municipality workers making them work efficiently and saving time.

A. SMS Alert

Fig. 5. SMS Notification

B. Flow Chart

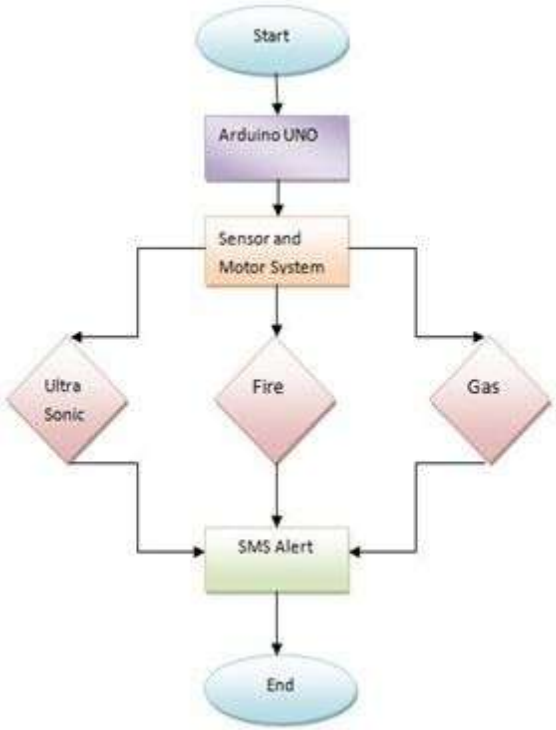

Fig. 6. Flow Chart

Advantages

- Efficient cleaning of garbage.
- Helpful for the municipality.
- On time collection of garbage.
- No bad odour around the bin.

VI. FUTURE TRENDS

This is a prototype for only one garbage bin but this system can be used by combining any number of garbage bins. Additional features can be added in the garbage bins like opening of the lid of the bin when a human approaches it, closing the lid when the dustbin is full or if it is raining. A smart dustbin can be developed with a piston so that it compresses off the garbage so more quantity of garbage can be stored in the garbage bins and all the space in the garbage bins can be used efficiently.

VII. CONCLUSIONS

There are a number of work being done to clean up the environment. When these Smart Garbage Systems will be implemented, the work of the municipality will become much more easier and they can work efficiently. The system will send the alert notification when the garbage is full in the garbage bins and help the municipality as well as the society to clean up the surrounding environment. The municipality workers can take immediate action with the help of this system and can do the cleaning process. Helping the municipality to work efficiently can help us to build a better environment.

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