

Trash Monitoring System using IOT

Sweety Shinde, Tanvi Bhagane , Aishwarya Hendre, Rachana Ganesh

Abstract: Our Prime minister Narendra Modi launched India's largest cleanliness drive named "Swacha Bharat Abhiyan" in 2014. The purpose of this drive is to improve cleanliness in our country which ultimately affect the human's health, But the methodology which recently used for monitoring garbage is not that much efficient. People facing lots of problem regarding overflow of garbage bins, garbage fire accidents, insufficient bins in areas etc. so on the Basis of this we are going to developed one project. This project will helps us to minimize the garbage disposal problem. In this project we are going to build partially automated system which reduce man power and control the monitoring system.

Keywords: IOT, TMS

INTRODUCTION

Our Prime minister Narendra Modi launched India's largest cleanliness drive named "Swacha Bharat Abhiyan" in 2014. The purpose of this drive is to improve cleanliness in our country which ultimately affect the human's health, But the methodology which recently used for monitoring garbage is not that much efficient. People facing lots of problem regarding overflow of garbage bins, garbage fire accidents, insufficient bins in areas etc. so on the Basis of this we are going to developed one project. This project will helps us to minimize the garbage disposal problem.

In this project we are going to build partially automated system which reduce man power and control the monitoring system.

For implementing this project we are going to use some new technologies i.e. IOT(Internet Of Things) & Sensors which is[4] easy to access and communicate too. Along with some new Technologies we also use some algorithms which are:

1. Haversine
2. K-mean

We differentiate the problems and according to that we assign various sensors. Following is the list which we are going to use in our project:

1. Ultrasonic Sensor
2. MQ7 Sensor

For better communication we are using microcontroller - Arduino.

LITERATURE REVIEW

^[1]Paper 1:

Title: IoT Based Waste Management for Smart City

keil µvision IDE:

It is easy to use which helps to achieve design goals and quickly support to develop embedded application

Arduino IDE:

It is flexible and Efficient. Group of people easily work together using Arduino IDE.

8051 Microcontroller:

[1]

-An 8bit single and single chip microcontroller

-128bytes RAM AND 4096bytes ROM

-40 PINS in dual in line package layout

-Reads and process on data collect from sensor

IR Sensor:

Secured Communication, Power saving, time efficient and used for level detection

RF Module:

Used for object detection ,Satellite Communication

System have one way communication between nodes like transmission and reception.

The serial input transmits through the RF module and it receive by receiver[5] and decoder is used by RF module to decode serial format and get original signal as output

Intel Galileo Gen2:

It will receive the data from multiple sources and process on that data and [6]transmitted to the Web browser.

WORKING PRINCIPLE:

Working principle is consist of two parts transmitter and receiver. In transmitter there are IR sensor ,8051 microcontroller ,RF transmitter and receiver[7] contains RF receiver,Intel Galileo Gen2 ,Web browser.

IR Sensor detect the level of garbade collect in dustbin and send the signal to the 8051 microcontroller and to drive the system power supply given to microcontroller by which we can process on that data and send it to the RF transmitter and then it will transmit that data to RF receiver and again data process into Intel Galileo Gen2 and give it to the client that is web browser.

^[2]Paper 2:

Title:Smart Garbage Monitoring System Using Node MCU

Ultrasonic Sensor:

Measure distance from object. But restriction to detect the object if object is too small it cannot detect by Ultrasonic sensor

PIR sensor :

Is used to detect the movements of any mammals is near to the garbage bins and indicator used for notifications

Moisture Sensor:

Used to measure water content. Differentiate wet and dry waste.

NodeMCU:

It have inbuilt wifi functionality and it works on ESP8266 Wi-Fi SoC

Arduino Uno:

It is Open source and extensible hardware ,Cross-platform and Large support of community.

WORKING PRINCIPLE:

In working principle we use three sensors ultrasonic for level detection , PIR sensor for motion detection and Moisture sensor for measure water content. All are fitted to inner cap of the garbage bins and sensor sence the waste in the bin and sends the message according to particular aspects of sensors. When the data collected at cloud then alert message get by particular apartments and it will helpful for different apartment to see the level of garbade and accourdingly notify to munciple office. And biodegradable waste is used for gardens so that it will also disposal easily.

^[3] Paper 3:

Title:IoT Bsed Garbade Management System

RasberryPi:

Handle web traffic ,cost effective,portable, power saving.

Flame Sensor:

Detect fog and smoke and detect and response the presence of flame,sensitive to ordinaey light. It detect flame if it have wavelength in between 760nm to 1100nm.

Ultrasonic Sensor:

It measures the distance using sonar and radar

It consist of two parts sound and another catches reflected echo

It detects solid and liquid level

WORKING PRINCIPLE:

The working principle consist of Rasberry-pi,ultrasonic sensor,flame sensor.the ultrasonic sensor measure the level of garbage in the bin by collecting all information it checks the threshold value and send the information to the certain authority via. Mobile or webpage.

METHODOLOGY

Ultrasonic Sensor:-

An Ultrasonic sensor is distance measure device using SONAR & RADAR. An ultrasonic sensor sends and receives the sound waves. Range of ultrasonic sensor is 2cm-400cm. It consist 2 parts- One part produces sound and another catches reflected echo. The sensor calculates distance and converts it to level, volume measurement and detects solid and liquid level.

Principle of ultrasonic sensor :

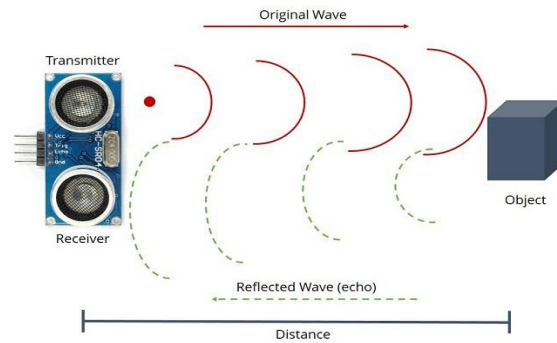
Ultrasonic transducer starts vibrating across a spectrum of frequencies after applying high voltage electric pulse and then generate burst of sound waves. As soon as an obstacle comes across sound waves will reflect back in form of echo and generates an electric pulse.

Formula : Test distance = (High level time * Velocity of Sound(340M/S) / 2

We are using this sensor for the purpose of detecting the level of garbage inside the bin.

To verify whether the bin is getting full or not. As soon as the bin is about to full the sensor will detect the level. Which will resolve the problem of overflow of bins.

Here we assing the threshold limit upto 75% i. e. whenever bin is get fill upto threshold limit, ultrasonic sensor detect the level of garbage and pass the message to collect the bin with particular bin_id.



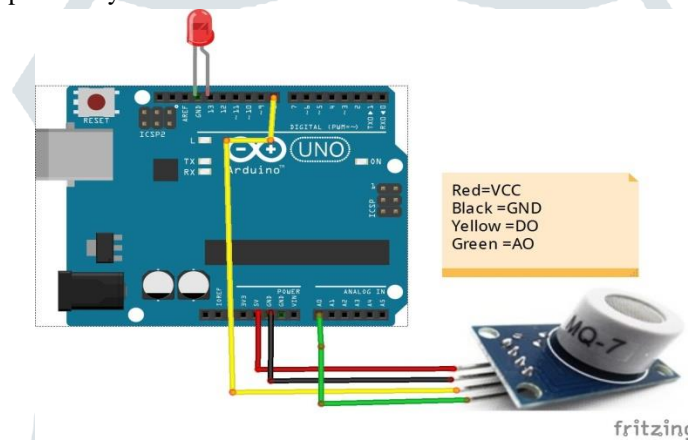
MQ7 SENSOR:-

MQ7 sensor is carbon monoxide(CO) sensor which is simple to access. It is suitable for sensing concentration in air. It has high sensitivity and fast response time.

At high temperature- heated by 5 V, it cleans other gases adsorbed at low temperature.

The MQ-7 detects CO-gas concentrations from 20 to 2000ppm.

It requires only one analog input pin from your microcontroller.



Here we are using this MQ7 sensor to overcome the problem of decomposition of garbage. Which is very vital issue as this decomposed garbage can releases harmful gases and directly affect surrounding living things. So on the priority basis this bin should get collected soon though it doesn't get reached to threshold value.

Arduino

Arduino is an open source microcontroller based platform which is easy to use hardware and software. The board are able to read inputs like sensor light, finger on a button etc. and these input turn into the output like activating a motor, turning on LED. To do so we use Arduino as a Arduino Programming Language and Arduino Software(IDE). We use Arduino because it can run on any platform, simple and easy for communication.



Haversine :

There are many distance calculating algorithms but we are using Haversine algorithm.

As haversine capable of calculating orthodromic distance between two distinct geological point with latitude and longitude. Whereas other algorithm can calculate straight distance.

[4]Formula:

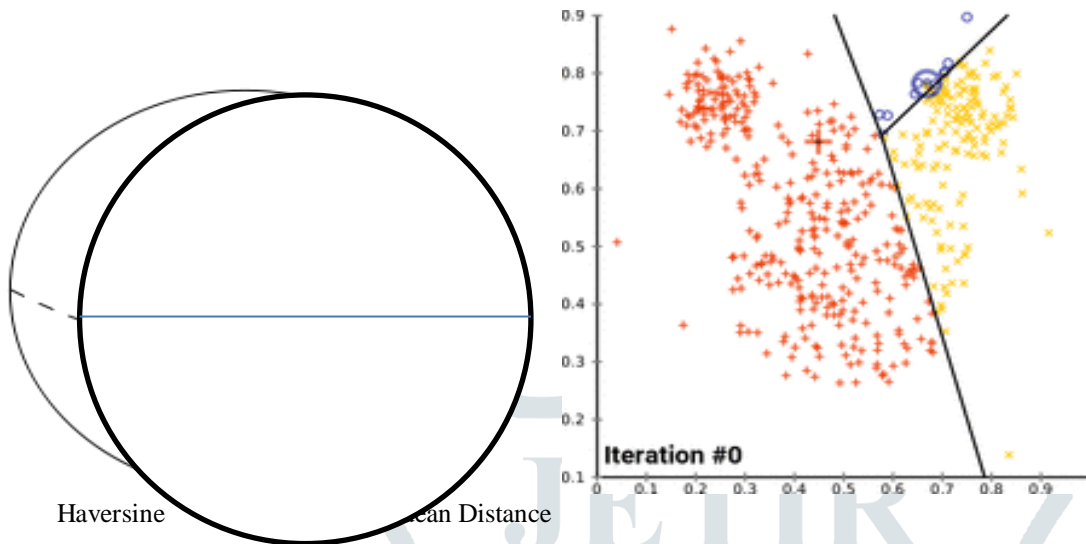
$$W= d/r$$

where, w= central angle

d= distance between two points (spherical distance)

r= radius of earth

$hav(w) = hav(q_2 - q_1) + \cos(q_1)\cos(q_2) hav(a_2 - a_1)$
 where, $q_1, q_2 =$ latitude point 1 and latitude point 2
 $a_1, a_2 =$ longitude point 1 and longitude point 2
 haversine function : $hav(w) = \sin^2(w/2) = 1 - \cos(w)/2$



K - means :

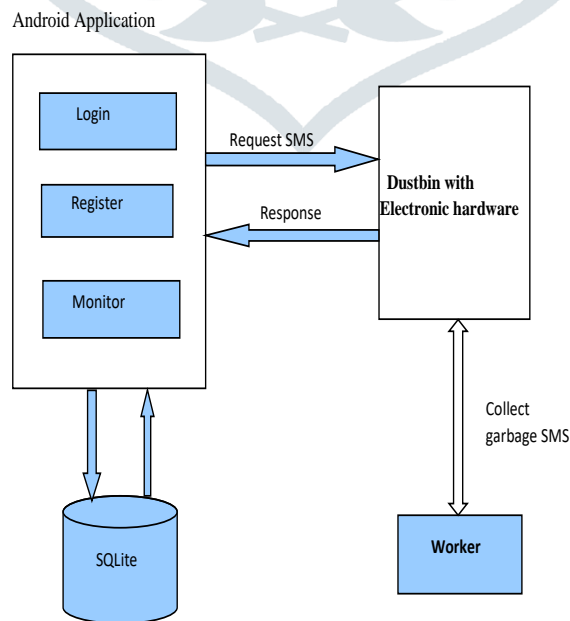
This algorithm is used whenever the huge number of variables are need to classify. It divides the data into K-cluster such that every variable belongs to cluster with nearest mean. It is simple unsupervised learning algorithm.

$$J = \sum_{n=1}^N \sum_{k=1}^K r_{nk} ||x_n - m_n||^2$$

Formula :

Here we use the K - mean to manage the bins which are located in different positions in the city. There are large number of bins even in small area and it should be clean time to time to avoid overflow of bins. Hence, it is essential to reach garbage collecting truck within a short time by using optical path. And aslo to determine which will be the truck nearest to bin K-mean algorithm is used.

WORKING PRINCIPLE



Trash Monitoring System, have three parts on which work can be done for Public Sector, Private Apartments and Farmer Sector. In which ultrasonic sensor use for level monitoring of Garbage bins, MQ7 sensor use for detect harmful gases and Arduino use for easy communication. In Public sector and Private Apartments Garbage can be monitor and according to level of Garbage Message can be send by Android application to Municipal office and accordingly they will send Driver for garbage collection. For Farmer Sector, if any farmer want garbage for there farm then they will directly contact to Municipal office so that it helps farmer to get garbage in original cost and Garbage also used for disposal purpose. According to System Architecture, There is Android Application have three parts Registration option is use when if user is new, Login option is use to login to the system so that all information about bin can be easily get and monitor option is to check exact condition of bins. All data fetch or store into the SQL database. According to level message is send to that Android application so that particular user can easily fetch that data and if bin is full then message send to driver so that to avoid overflow.

ADVANTAGES

- Smart garbage management system makes the garbage collection more efficient,
- It ultimately helps to keep cleanliness in the society
- Monitors the garbage bins and informs about the level of garbage collected in the garbage bins
- To keep our Environment clean & green,
- The cost effort are less in this system and Automatic garbage level detection prevent overflow

CONCLUSION AND FUTURE SCOPE

The main objective of this project is to maintain the cleanliness in the city. by using this system we frequently check the level of garbage in the bin which are located in different areas. If a particular bin is reached upto threshold limit then admin will send the message to nearer garbage collector and garbage collector pickups the bin. This can prove to be a useful system if it used in proper way. we will enhance this system in future with the separation of dry and wet garbage.

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