



Review on Smart Dustbin with Waste Separator

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ABSTRACT-

With increase of population, the scenario of cleanliness with respect to garbage management is degrading tremendously. In city there are many public places where we see that garbage bins or dustbins are placed but are overflowing. This creates unhygienic condition in the nearby surrounding. Also creates ugliness and some serious diseases, at the same time bad smell is also spread and it also degrades the valuation of that area. To avoid such situation, we come up with a project called "Smart Dustbin" which is a GSM based Garbage and waste collection bins overflow indicator system for Smart Cities. Over main motivation behind this project is the ongoing campaign Swachh Bharat Abhiyan (Clean India Movement) launched on October 02, 2014 at Rajghat, New Delhi, by the Prime Minister of India Narendra Modi which is India's largest ever cleanliness drive to clean the streets, roads and infrastructure of the country's 4,041 statutory cities and towns. As people are getting smarter so are the things. While the thought comes up for Smart cities there is a requirement for Smart waste management. The idea of Smart Dustbin is for the Smart buildings, Colleges, Hospitals and Bus stands.

Smart dustbins is a new idea of implementation which makes a normal dustbin smart using Infrared Sensors for garbage level detection and sending message to respective municipal authorities updating the status of the bin using GSM modem.

Even this is a touch free dustbin so, when any person reaches near to it, the lid will open automatically so there is no need to open that dirty lid by your hands. This project also includes a Green LED to indicate that the dustbin is Empty and a Red LED to indicate the Full condition.

As soon as the garbage inside the dustbin reaches as the approx. level of 90% a Buzzer will turn ON for few seconds to tell the user not to use this dustbin and Red LED will be turned on until it's Empty again. Till the dustbin is empty again, the lid will not open so that no one can through garbage into it and create mess.

Introduction~

The most common problem during the summer season is pollution, dust, and allergies. With increase in the number of pollutants in the soil, there is an increase in the demand for cleanliness. These dustbins can be used in offices, homes, commercial places, and if the efficiency is high, then they can also be used outdoors. This project will send an SMS to respective municipal authorities which contains the details about the overflowed dustbin.

Though the world is in a stage of up gradation, there is yet another problem that has to be dealt with. Garbage! Pictures of garbage bins being overfull and the garbage being spilled out from the bins can be seen all around. This leads to various diseases as large number of insects and mosquitoes breed on it. A big challenge in the urban cities is solid waste management. Hence, smart dustbin is a system which can eradicate this problem or at least reduce it to the minimum level. Our present Prime Minister of India, Sri Narendra Modi ji has introduced the concept of implementing 100 smart cities in India.

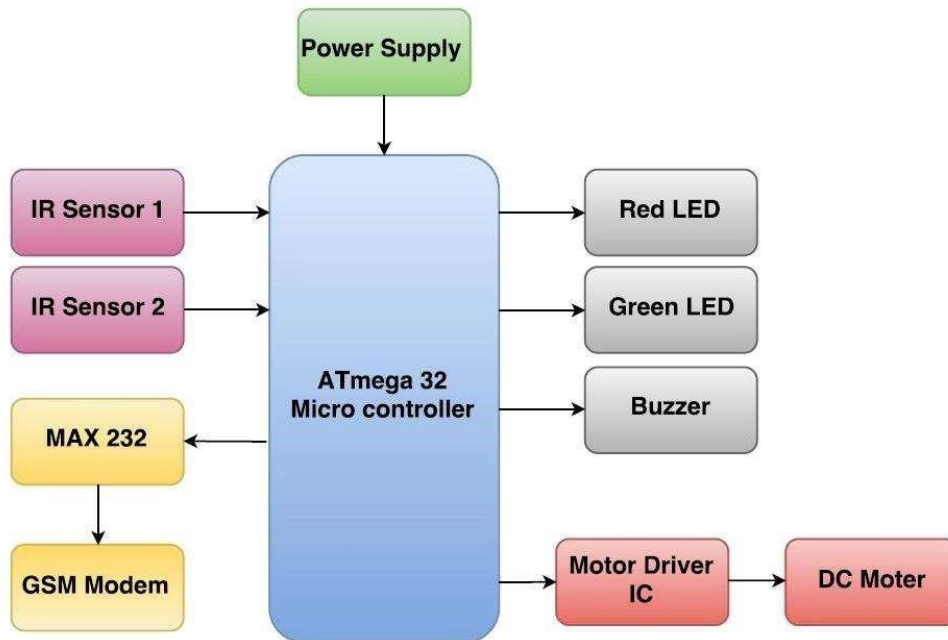
"Swachh Bharat Abhiyaan" was initiated to ensure a clean environment. Majority of viruses and bacterial infections develop in polluted environment. Safeguarding the environment using technology sources is needed at present. Majority of the public environment seems to be polluted with the waste material. So, modernization of the restaurants is needed by imparting the smart technology. Amounts of waste are largely determined by two factors: first, the population in any given area, and second, its consumption patterns. Most of the cities, towns and villages in India are not well designed to facilitate the suitable garbage collection methods.

Common Public dustbins are filling over with the garbage and no one is concerned to clear them up as and when they get completely packed with overflowing garbage. Keeping in view of this big problem, it will be a good suggestion to do something to deal with this unmanaged waste and from this; the concept of 'Smart Dustbin' came out.

The smart bins are used as ultrasonic sensors which detect the garbage. The container is divided into three levels of garbage being collected in it. Every time the garbage crosses a level the sensors receive the data of comes garbage to the bin. This data is further goes to the servo motor threw the Arduino Uno circuit board. Placing the ultrasonic sensors at the top of the bin, like on the cover of the bin.

The comparison is done with help of microcontroller. After analysing the image an idea about level of garbage in the can and from the load cell sensor, weight of garbage can be known.

Accordingly, information is processed that is controller checks if the threshold level is exceeded or not. This is convenient to use but economically not reliable. Instead of using plenty of bins in an unordered fashion around the city, minimal number of smart bins can be used. Using only one sensor at the surface level instead of three not only makes it affordable but also achieves the same result. To design a “Smart Dustbin” which is an Ultrasonic Sensor enabled in bin which automatically detects the garbage and set the code in the Arduino circuit board which help to open and close after detect the garbage. Smart bin is built on a microcontroller-based platform Arduino Uno board which is interfaced with Ultrasonic sensor. And it’s connected with the servo-motor.



Observation~

AEIOU Framework

AEIOU Design Thinking Worksheets developed by Mark Baskinger and Bruce Hanington is an interrelated framework that guides designers in thinking through a problem or scenario from a variety of perspectives: activities, environments, interactions, objects, and users. They are useful in organizing thoughts, observations, and ideas into distinct categories. AEIOU differs from our Drawing Ideas Quick-Start Worksheets in its formality and strict adherence to these five dimensions of a design space AEIOU CANVAS 4.

Activity (A) Canvas

Activities observation record sheet involves micro-observation of the activity process. It includes activities which are done by users.

Environment (E) Canvas

Environment observation involves the observation of surrounding like activities that take place in. The atmosphere at project or in such field areas is very crucial. Environments involved in our project are places with overflowed trash in bin. Interaction (I) Canvas

Interaction observation involves the observation that who is interacting or communication with whom and for what purpose at project. The interactions involved in our project are Common people, Students, etc.

Object (O) Canvas

Object observation record sheet involves the observation of object or materials or components used for project. Object involved in project are bin, GPS, Ultrasonic sensors, Plastic. User (U) Canvas User observation record sheet involves the observation of how user uses the product for their need or to get a solution from a problem and what responsibilities they perform. Users involved in our project are people walking by, drivers, near school, for clean environment.

Hardware and Software Required~

Software Components

Software requirement for monitoring and data processing ARDUINO IDE (1.8.19) VS CODE (Platform IO). Py. Charm IDE with Python Version: 2022.2.1 are required.

Hardware Components

Component required for Air quality monitoring Temperature Humidity Sensor, CO2 Sensor. For air filtration activated carbon filter, HEPA filter, Pre-Filter are used for data processing Arduino Uno is used Rover consist of ultrasonic sensor, GPS module, Omni, Wheel, Motor Card board etc.

Ultrasonic sensor

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound.

Ultrasonic sensors have two main components: the transmitter and the receiver. In order to calculate the distance between the sensor and the object, the sensor measures the time it takes between the emissions of the sound by the transmitter to its contact with the receiver. The formula for this calculation is $D = \frac{1}{2} T \times C$ (where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second).



Fig. Ultrasonic Sensor

Arduino UNO

The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms. The IDE is common to all available boards of Arduino.



Fig. Arduino UNO

Servo motor (SG 90) There are lots of servo motors available in the market and each one has its own speciality and applications. Most of the hobby Servo motors operates from 4.8V to 6.5V, the higher the voltage higher the torque we can achieve, but most commonly they are operated at +5V. Almost all hobby servo motors can rotate only from 0° to 180° due to their gear arrangement so make sure you project can live with the half circle if no, you can prefer for a 0° to 360° motor or modify the motor to make a full circle.

Conclusion~

We are able to know how people suffer from this problem and we also got to know about the working functionality of cleanliness. This project work is the implementation of Automatic Garbage Fill Alerting system using Ultrasonic sensor, Arduino Uno, Buzzer and Wi-Fi module. This system assures the cleaning of dustbins soon when the garbage level reaches its maximum. It will take power supply with the help of Piezoelectric Device. If the dustbin is not cleaned in specific time, then the record is sent to the Sweeper or higher authority who can take appropriate action against the concerned contractor. This system also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. This reduces the total number

of trips of garbage collection vehicle and hence reduces the overall expenditure associated with the garbage collection. It ultimately helps to keep cleanliness in the society. Therefore, the Automatic Garbage Fill Alerting system makes the garbage collection more efficient.

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