

## IOT based Garbage Management System

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**Abstract-** Garbage management is a major issue for almost every country, developing or developed alike. Innumerable garbage bins and dust bins are left unattended due to lack of management which leads to unhygienic conditions and creates an unhealthy environment. It could also result in spread of diseases and illnesses. To avoid such problems, we have designed an "IOT Based Garbage Management System". The main idea of this system is to discern whether the garbage bin is full or not in order to make efficient use of time and man-power by providing instant cleaning of the dustbins. Arduino UNO, interfaced with the ultra-sonic sensor is mounted on every garbage bin which checks the level of the garbage in the bin and sends the alert signal to the municipal web server forthwith if the garbage bin fills up to a set minimum threshold level. After cleaning the dustbin, the status of the bin is automatically set to empty in the municipal web server. The whole process contains an embedded module integrated with RFID and IOT facilitation. Also, the real time status of how much garbage has been filled can be monitored by a municipal authority which controls the system. We have also developed an android application which will be linked to the municipal web server to notify the alerts from the microcontrollers to the driver to take necessary action thereby reducing the manual process of monitoring and verification. The notifications are sent to the android application available to the driver.[1,2]

**Key Words:** Garbage Management, Arduino UNO, Wi-Fi, Ultrasonic Sensor, GPS, IoT, e-Monitoring.

### I. INTRODUCTION

Ever increasing amount of waste is a serious concern. Human lives are adversely affected by the surroundings in which they live due to improper waste management. Continuous disposal of waste and lack of waste management technique creates a major dismay towards human lives as well as environmental conditions. For proper disposal of garbage, it is a must to segregate the garbage. People never think about the consequences of their action of tossing waste away. The common uncontrolled and unplanned method of disposal of the industrial waste, exposed dumping at the river sites and open areas, leads to the pollution and leads to unhygienic conditions. This practice is hazardous to biotic life.[3]

Roadside garbage collection is one of the common method of disposal in most of the countries, in which garbage is collected by using garbage vehicles at regular intervals of time. Garbage which is collected is then shifted to an appropriate disposal area or at a dumping yard. Nowadays,

developing cities experience exhausted waste collection services, inadequately managed and uncontrolled dumping problems. Many countries are facing real time problems in order to manage wastes and to collect it on a regular basis to make their country clean and hygienic. Today the amount of garbage has crossed the threshold value and is increasing day by day with increase in the population and modern lifestyle. Due to the lack of proper management, a considerable amount of manpower is invested in garbage collection and management without getting befitting results. Hence, improvement of the garbage management system has become a necessity which requires a well-organized and planned way to monitor the status of garbage bin in real time ensuring green environment and viable advancement of the society.

Modern cities have a promising potential application domain for the IOT, with a wide range of services that can benefit city management and administration. One service that can be provided in such cities is smart waste management. Public trash cans become worthless when they are full for an

extended period of time. On the other side it is a costly operation to send garbage collecting vehicle to empty every garbage can in the city; if cans are empty, the journey becomes that much more worthless, wasting time and energy. The services already provided by the concerned authorities for management of garbage can be made more efficient by using IOT kits and the system we proposed.

### 1.1 PROBLEM STATEMENT

Nowadays we can see that most of the garbage across the roadside are overloaded because the wastes are not collected periodically. It creates unhygienic condition for the people and spread diseases. Using plenty of bins in an unordered fashion around the city or village can be a hectic task for the concerned authority. In order to minimize the overhead, minimal no. of garbage bins can be deployed with sensors which can be easily manageable. It is a common problem for the dustbins to overflow and concerned municipal authorities fails to get the status updates of bins in stipulated time.

### 1.2 REVIEW OF LITERATURE

#### Ultrasonic Sensor:

Ultrasonic sensor is a device which calculates the distance of an object by using sound waves. It calculates distance by sending out a sound wave at a specific frequency and waits for that sound wave to bounce back.

The ultrasonic sensor is used to check the level of the garbage filled in the garbage-bin. An ultrasonic sensor creates two pulses i.e. ping(which sends the pulse) and listen(which detects the reflected pulse). Sound travels at approximately 341 m/s in air. By using this information and recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sensor and the object.

Fig 1.2.1 Ultrasonic Sensor



#### Ultrasonic sensor module :-

Vcc - 5V power supply  
 Trig - Trigger Pin  
 Echo - Echo  
 Pin GND -  
 Ground

#### Arduino:

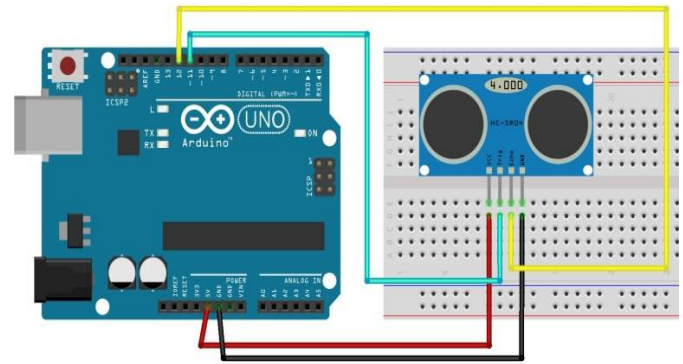


Fig 1.2.2 Arduino with ultrasonic sensor

Arduino is open source platform. It is used to develop hardware that is electronic project. Arduino consist of micro-controller and IDE. Arduino write and then upload computer code to physical code.

The information required for the project domain was acquired from various source such as books, various websites, online tutorials and also the knowledge from various expert from the particular domain.

Lastly, 'Software Engineering-A practitioner's Approach' by Roger Pressman, a book for software engineering helped us in giving the proper path to pursue the project. It showed us how any software project should be made to completion by following the steps of construction, planning, design, development, implementation, maintenance and deployment.

## II. PROPOSED METHODOLOGY

In, India, a costly garbage bin is not a feasible situation. Garbage bins must "smart" enough to calculate the amount of waste in bins and for this we have used an ultra-sonic sensor. Garbage management system which already exist involves complex circuitry and high costs and its features are also limited. Our plan was to design and develop an effective, economical system with extended features for garbage management.

To check garbage in the dustbin, many sensors can be used like IR sensors, weight sensors etc. But here we are using ultrasonic sensors which directly gives us information about percentage of garbage that is level of dust bin filled. This system advantageous over weight sensors as weight sensors only let us know about the weight of the garbage, but this does not let us know the level of waste in the garbage bins. The system will provide high QOS to the citizens of smart city.

### III. IMPLEMENTATION

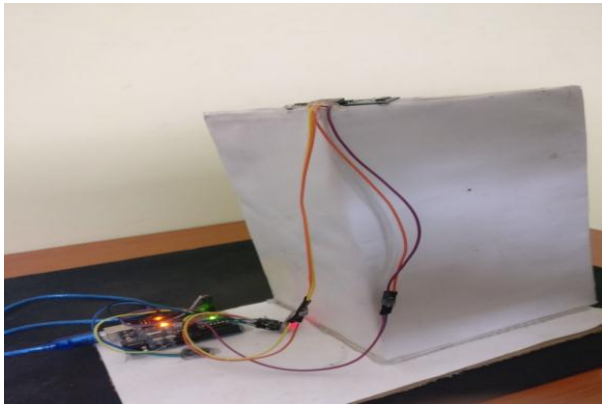


Fig 3.1 Garbage Bin module

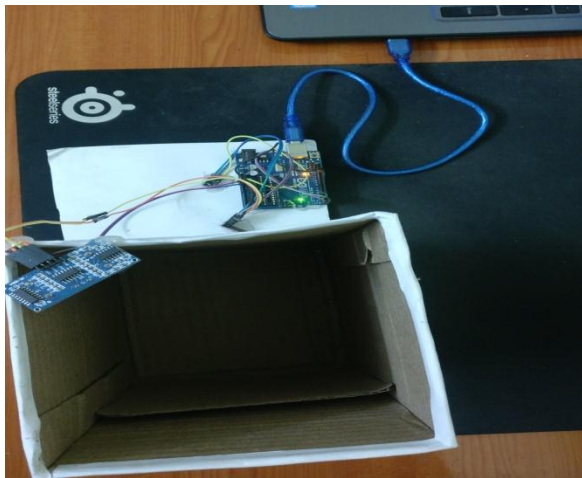


Fig 3.2 Top view of garbage module

This is our developed garbage bin module in which ultrasonic sensor is mounted at the inside of the top facing the trash, which is connected to Arduino consisting of microcontroller and IDE, which writes and uploads computer code to physical code to sense the height of garbage.

Ultrasonic transmitter module emits an ultrasonic wave which gets reflected by any object back to the sensor which is observed by ultrasonic receiver module. Wi-Fi module sends the level of garbage filled in the bin to the web server where service receives it and update the data of respective dustbin in database.[2]

The Admin side has the authority of handling the driver, allocation of new bins, Registration/de-registration of vehicles. Driver's registration is also managed by admin side along with bin allotments.



Fig 3.3 Admin registration page



Fig.3.4 Allotment of Bin to Driver



Fig.3.5 Driver Registration



Fig 3.6 Bin Registration

### IV. Deliverables

This system fetches the data of garbage with the help of the Ultra-Sonic sensor Also the notification is sent to the corresponding driver after the garbage reaches a maximum height. The current status of garbage bin can be viewed also through the graphical interface.

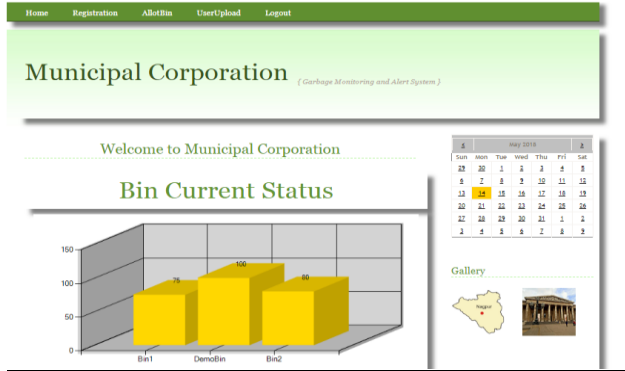


Fig. 3.7 Bin Status

Another service on the web server checks if the percentage of dustbin filled is over the set threshold. If this is the case, a notification is sent on the mobile app of the respective driver allotted to that bin.

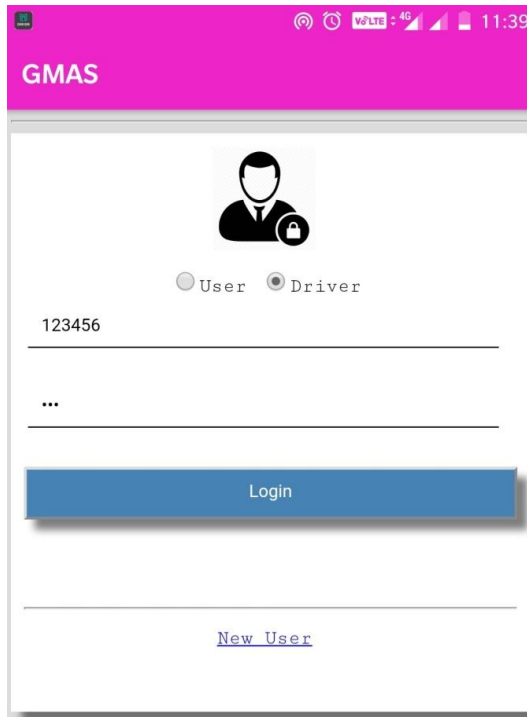


Fig.3.8 Driver Mobile view

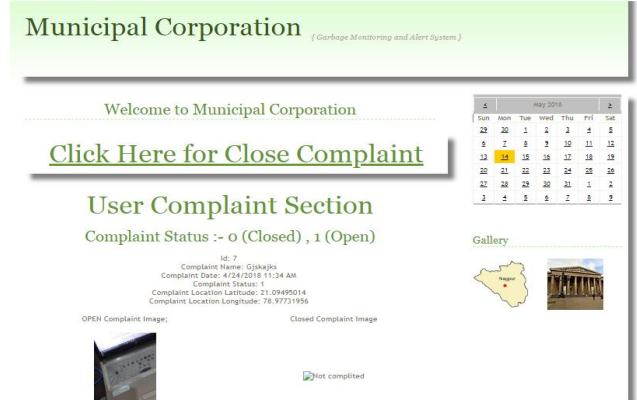


Fig. 3.9 User complaint section

In case of any complaints or any unattended garbage bins, users can also post their complaints in the user complaint section. The status of these complaints can later be updated as done and the user also gets the notification for the same.

#### Flow Chart:-

The flow chart provides a rough idea of how the project will work. It depicts the flow of the project of IOT based Garbage Management System initializing with start. Ultrasonic sensors are used to check and sense the level of garbage in the bins. When dustbin crosses the threshold i.e. the level set for dustbin to be cleaned and an alert message is sent to the concerned authority and then concerned authority can take the necessary actions. Also, the status of the bins can be seen on the municipal web server and changes time to time as waste increases or decreases.[4,5]

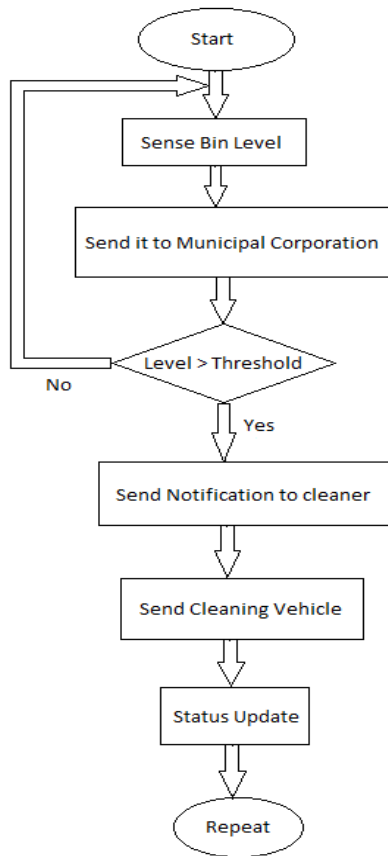


Fig.3.10

## V. CONCLUSION

The main objective of this project is to get real time access of garbage level of the dustbin. This IOT based garbage Management Systems theme is to do the management of waste in real time using smart dust bin by checking the fill level of dustbin to know whether it is filled or not. It will lead to reduced human efforts, efficient use of time and fuel, cost efficiency and provide hygienic conditions. In this system, information about the dustbin level is sent to municipal corporation and the appropriate action must be taken by the corporation based on the current condition.[6]

## VI. ADVANTAGES

- Checks the height of the garbage deposited in the garbage bin and notifies the corporation.
- Cost efficient and less effort required.
- Helps in maintaining the surrounding clean and green.
- Reduces the consumption of time and fuel.
- Keeps environment healthy and hygienic.

## VII. APPLICATIONS

This will Empowered Swachh Bharat Mission. This System Supports digital India Improve real time-based cleaning of the area. It also makes the working transparent between drivers, workers & the municipal corporation.

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