



## IOT BASED GARBAGE COLLECTOR

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### ABSTRACT

Garbage bins remain uncollected for long periods of time putting the lives of marketers at risk in an event that there is Cholera outbreak especially during the rainy season. This happens because we do not have a system that monitors the garbage levels and notifies the Central Office. In order to avoid such a situation, this project proposes the design and implementation of a GPS and IOT Based Garbage and Waste Collection Bin Overflow Management System using GPS and IOT technology in providing real time information on the status of the garbage bins, i.e. when they are full so that appropriate action can be carried out. The system notifies the person (Truck Driver) in charge of garbage collection by IOT web notification and telling them where the full bin is exactly located. Again after sometime the system notifies the Central Office that the message has been sent to the Driver. This development will ultimately save a lot of time especially when the we does not have to go and check the level of garbage in the bin. Besides, it will timely prevent the overflow of garbage due to the fact that garbage will be collected on time. That is, the council will collect garbage only when it is time to do so rather than routine where even half-full bins are collected.

### 1. INTRODUCTION

We are living in an age where tasks and systems are fusing together with the power of IOT to have a more efficient system of working and to execute jobs quickly! With all the power at our finger tips this is what we have come up with. The Internet of Things (IoT) shall be able to incorporate transparently and seamlessly a large number of different systems, while providing data for millions of people to use and capitalize. Building a general architecture for the IoT is hence a very complex task, mainly because of the extremely large variety of devices, link layer technologies, and services that may be involved in such a system. One of the main concerns with our environment has been solid waste management which impacts the health and environment of our society. The detection, monitoring and management of wastes are one of the primary problems of the present era. The traditional way of manually monitoring the wastes in waste bins is a cumbersome process and utilizes more human effort, time and cost which can easily be avoided with our present technologies. This is our solution, a method in which waste management is automated. This is our IoT Garbage Monitoring system, an innovative way that will help to keep the cities clean and healthy. Today main issue for pollution is Garbage Overflow. It creates unhygienic condition for the people and creates bad smell around the surroundings this leads in



spreading some deadly diseases & human illness. To avoid all such situations we are going to implement a project called IoT Based waste management using smart dustbin. Implementation is done with the help of IoT concept. The Internet of Things (IoT) is a concept in which surrounding objects are connected through wired and wireless networks without user intervention. Objects communicate and exchange information. In this system multiple dustbins are located throughout the city or the Campus, these dustbins are provided with a sensor which helps in tracking the level and weight of the garbage bins and a unique ID will be provided for every dustbin in the city so that it is easy to identify which garbage bin is full. When the level and weight of the bin reaches the threshold limit, the device will transmit the reading along with the unique ID provided. In order to avoid the decaying smell around the bin harm-less chemical sprinkler is used which will sprinkle the chemical as soon as the smell sensors detect the decaying smell. Once the bins are full then user will not be able to access the bins. In such circumstances the bin displays the direction of the nearby bins on LCD display also generate the voice messages if the user place the waste on the floor. The status of the bin is accessed by the concerned authorities from their place with the help of Internet and an immediate action will be taken to replace overflowing bins with the empty bins. In this project methodology model takes the fundamental process activities of Project Plan, specification, Analysis, Design, development, validation and evolution and represents them as separate process phases. Using a waterfall model as a project development methodology. Do to Specific system models, system architecture and detailed

design of the project, to implementation process using Eclipse JUNO tool and Arduino tool with java language for developing the modules in windows platform. In the smart dustbin hardware contains motor-driver, 16\*2 LCD Display, Arduino UNO, Load cell, Playback IC, Speaker, IR Sensors, Smell Sensors , Bread Board, Power Supply and Raspberry pi. In the smart dustbin IR sensors will continuously monitor the status of the bin. If the bin reaches more than certain weight, the weight sensors will trigger the message to the concerned authority. Also when certain threshold level is reached, the level sensors will trigger the message to the concern authority. Here when the bin is filled it will give the user the details of the empty bins which are nearby with the help of LCD display, these dustbin will generate voice messages with the help of playback IC and speaker.

## 2. LITERATURE SURVEY

The idea of smart garbage bins and systems have been in discussion for quite a long time. The technologies used at disposal to develop this smart system have also evolved, Internet of Things (IoT). Each idea seems to be similar but is slightly different at its core and our proposed work is no exception from the same. After the IoT field, finding its hold in our lives, this is our original plan for designing a smart garbage collection system which has provision for citizen participation and analysis of data for better decision making. At hardware level, the smart system is a garbage bin with IR sensor, a micro-controller and Wi-Fi module for transmission of data. The worldwide implementation of Internet of Things is possible with a Cloud centric vision. This work exploits



the future possibilities, key technologies and application that are likely to drive IoT research. But a strong foundation to our work is provided, where the basics and applications of Arduino board is explained. It is quite interesting as it implements a GAYT (Get as You Throw) system concept as a way to encourage recycling among citizens. As we would discuss further, the citizen participation part of our system is quite influenced by their work Solid waste management (SWM) is the process of collecting, handling, and disposing of no longer in use solid objects that are discarded[1]. In today's world, typical solid waste management includes large outdoor waste bins, waste pickup trucks, and scheduled pickup routine by the related party. Manaf et al. [2] explain that solid waste is categorized into three categories; each is handled by different authorities. The categories of solid waste and the related party that's responsible for handling the waste. In London, solid waste collection is carried out based on selective collection requirements. Different color of garbage bags and/or garbage bins is used for different categories of solid waste. The examples of this color categorization are the yellow container for hospital waste, the red container for toxic waste and black container for household waste [3]. Pardini et al.[4] On the other hand, smart solid waste management system (SSWMS) is a smart system that links smart waste bins (as smart objects) to web-based and/or mobile-based application through cloud servers using Internet-of-Things (IoT) technologies [12]. IoT allows traditional, physical objects to communicate among each other by transforming them into "smart objects" using several essential

technologies such as embedded devices, sensor networks, and Internet protocols [13].

The overall concept of IoT is depicted in Figure 1 which shows an example of domains suitable for IoT services. In a SSWMS, the smart waste bins are integrated with several sensors (e.g., proximity sensor, weight sensor, temperature sensor, etc.). Example of working smart waste bin is produced by ZAN Compute Inc. called Smart Garbage Bin, as patented by Shahabdeen [14]. These sensors then collect related real-time data regarding the solid waste inside the bin before the microcontroller embedded on each bin transfer the data to Cloud servers. Next, the Cloud servers communicate with specially developed mobile-based and/or web-based applications for monitoring and management purposes. This SSWMS is important as its efficiency is proven to be better than the traditional waste management procedures. The aim of this system is to assist the waste management team to carry out their work more efficient in terms of (but not limited to) monitoring, scheduling and cutting operational cost. For example, the implementation of Big belly Solar Waste & Recycling System (BSWRS) in smart cities such as Hamburg and New York City has managed to help these cities reducing their number of waste pickups up to 80% while also reducing the waste collection costs around 75% [15]. There is no universal solution on how SSWMS should be planned and implemented as it is a complex task. Therefore, several factors and aspects need to be considered and analyzed. IoT is an integral part of any development and implementation of SSWMS. According to Dorsemaine et al.,[16]Internet-of-Things (IoT) is a group of infrastructures interconnecting linked objects

and permitting their management, data mining and access to the information they generate.

### 3. EXISTING SYSTEM

In the existing system garbage is collected by corporation by weekly once or by 2 days once. Though the garbage shrinks and overflows the garbage bin and spread over the roads and pollutes the environment. The smell will be heavy and produces air pollution and spreads disease. The street dogs and animals eat the waste food and spread over the area and creates dirty environment to avoid such situation we are planning to design IOT Based Garbage Management for Smart Cities. Disadvantages of existing system Time consuming and less effective: trucks go and empty containers whether they are full or not. High costs. Unhygienic Environment and look of the city. Bad smell spreads and may cause illness to human beings. More traffic and Noise.

### 4. PROPOSED SYSTEM

Whenever the garbage is full information can be send to the concerned authority to clean the bin. IOT is used in the project as a communication back bone for the whole system for various reasons like low cost, easy to implement and less signal deterioration. This project uses the ultrasonic sensor module, IOT Modem, the ARDUINO UNO Microcontroller and Liquid Crystal Display (LCD). Without a smart waste management system, any smart city is incomplete. In the proposed system, the level of waste material in the garbage bin has been

detected with the help of ultrasonic sensor and it will continuously communicate to the authorized control room through IOT module. Microcontroller is used to interface the sensor system with IOT system. A GUI is also developed to supervise the desired formation related to the garbage for various selected locations.

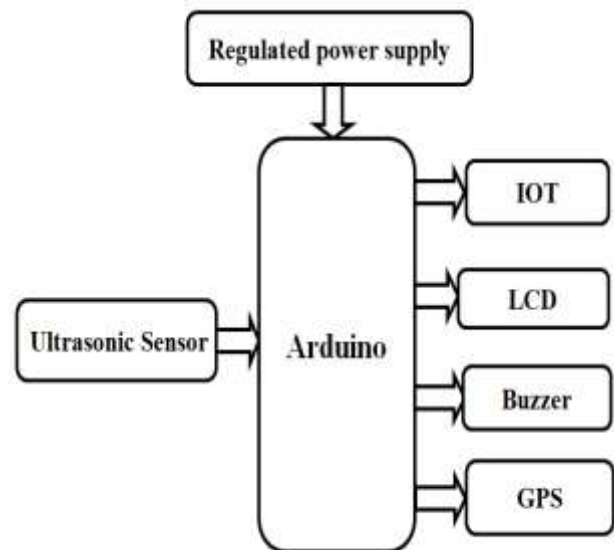


Fig.1. Proposed block diagram

#### WORKING MODEL:

There are 5 modules one is regulated power supply in this adaptor converts 230 volts of AC TO 12 voltage DC by the capacitor we can reduce the noise and the voltage regulator converts the 12v of DC to 5v DC. The 5v DC power is supplied to Arduino, Ultrasonic sensor, GPS module and IOT module. Input of the project is GPS module (NEO-6M) it collects the data directly from the satellite and it stores in Arduino control. And second input is ultrasonic sensor (HC-SR04) used to measure the dust level. Output of this project is 16 by 2 LCD which is used to display the output. And buzzer gives the alert when the bin reaches the

maximum level. IOT module (ESP 8266) which is used to post the data to the user. To post the data to server we need internet through mobile by the hotspot. After connecting to the WIFI the data is posted to the web server. In the web server garbage level location and date and time is displayed. So that we can track the location.

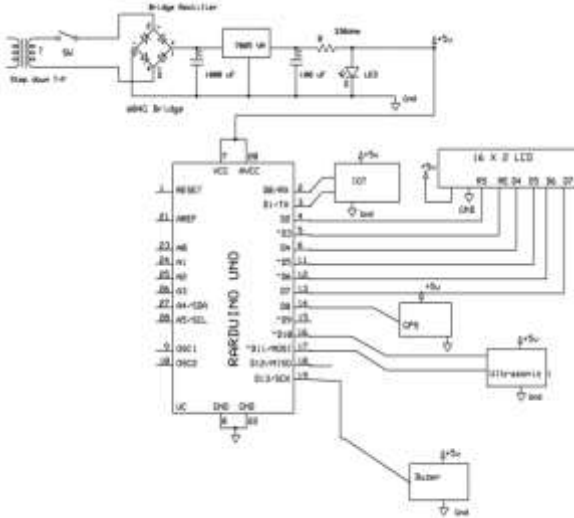


Fig.2. Proposed Circuit diagram

### PIN DESCRIPTION

- IOT module is connected to D0 and D1 Pins.
- LCD module is connected to D2, D3, D4 D5-, D6, D7 pins of Arduino UNO.
- GPS is connected to the D8 pin of Arduino UNO.
- Ultrasonic sensor is connected to the D10 and D11 pins.
- Buzzer is connected to the D13pin.

## 5. RESULTS

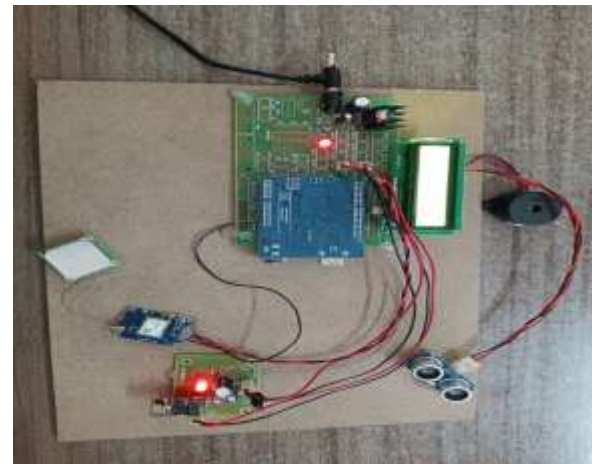


Fig.3. Proposed Output model

When the power is on the LED on the Arduino gets on and blink red colour. And the LCD gets on and displays the title of the project which is IOT garbage collector. And LED on IOT module also blinks which is used to pass the data to the server.

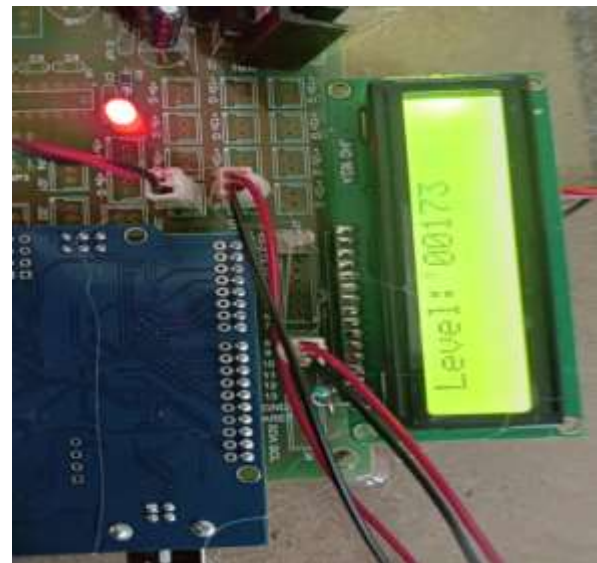


Fig.4. LCD Output Level Indication

When the module is on the process gets start and measure the bin level. As it measure the Latitude and longitude level .When it reaches the maximum level the buzzer gives the



indication by the buzzing sound. And the IOT module uploads the data to the server.

For the tracking of the location web page is created. In the web page level, location, date and time is mentioned. When the bin gets filled it uploads the data to web page. By clicking on the location we can track the location through GPS module.

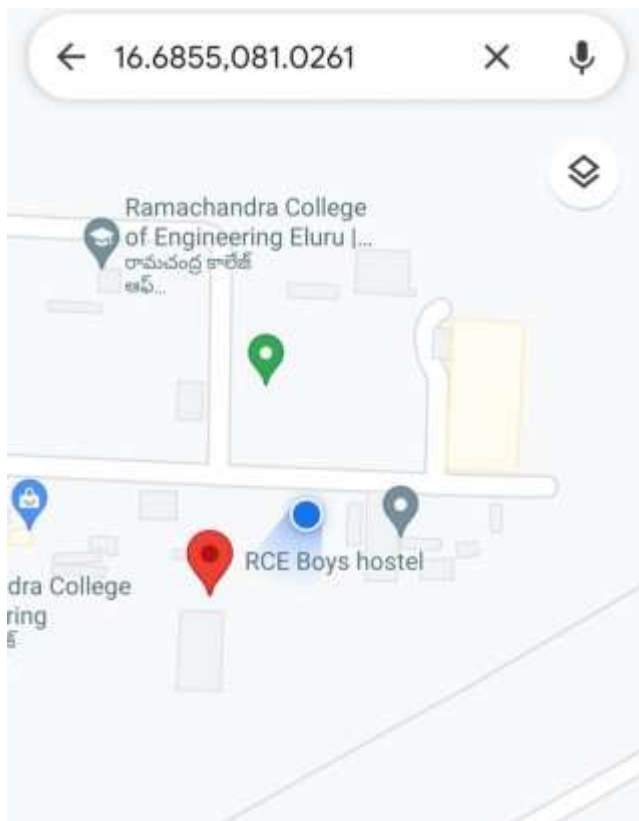


Fig.5. Output Location Tracking

Table.1 Results comparison Table

Parameter	Existing Model	Proposed Model
Microcontroller	8051	Arduino
Speed	Low	High
Complexity	High	Low
Efficiency	LOW	HIGH

## 6. CONCLUSION

We designed and implemented IoT smart garbage collector using Arduino, Ultrasonic sensor, GPS module and IOT module. The system is able to monitor the garbage level in the bin, avoid the overflow of garbage by notifying the collector via an IOT SMS and give the precise location. The system provides an efficient and effective way of garbage collection. When the bin reaches the maximum level. IOT module (ESP 8266) which is used to post the data to the user. To post the data to server we need internet through mobile by the hotspot. After connecting to the WIFI the data is posted to the web server. In the web server garbage level location and date and time is displayed. So that we can track the location. We executed required outcomes successfully.

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