

# SMART CITY- GARBAGE MONITORING SYSTEM USING IOT

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## ABSTRACT

One of the main concerns with our environment has been solid waste management which is disturbing the balance of the environment and also has adverse effects on the health of the society. The recognition, monitoring and administration of wastes is one of the primary problems of the present era. The traditional way of manually monitoring the wastes in waste bins is a complicated, unmanageable process and utilizes more human effort, time and cost which is not congruous with the present day technologies in any way. This project Garbage Monitoring using IOT is a very innovative system which will help to keep the cities clean. IOT is the network of physical devices embedded with software and sensors and network connectivity which enables these objects to collect and exchange data. This system will monitor the garbage bins and informs about the level of garbage collected in the garbage bins via a web page. This web page also contain all information about garbage collection vehicles. If the Garbage Collector is filled up to its threshold value then the message is displayed on web portal and the responsible authority take proper action also all the information regarding to the level of Garbage present within the Smart Bin is displayed on to the Smart Bin Application on the users mobile phone. This is an advanced method in which waste management is automated.

**Keyword:** Internet of Things(IOT), Wireless Communication, Arduino, Ultrasonic sensor, WIFI module, GUI, Webpage, Database, Android App.

## 1. INTRODUCTION

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. People those who work in this garbage collection job are totally disappointed by the residents improper waste management scenario. Nowadays due to high hygienic standards, collecting garbage and maintaining cleanliness is important task of the municipal waste management system. Hence, smart dustbin is a system which can eradicate this problem or at least reduce it to the minimum level. Majority of the public environment seems to be polluted with the waste material. Safeguarding the environment using technology sources is needed at present.

### 1.2 PROBLEM STATEMENT

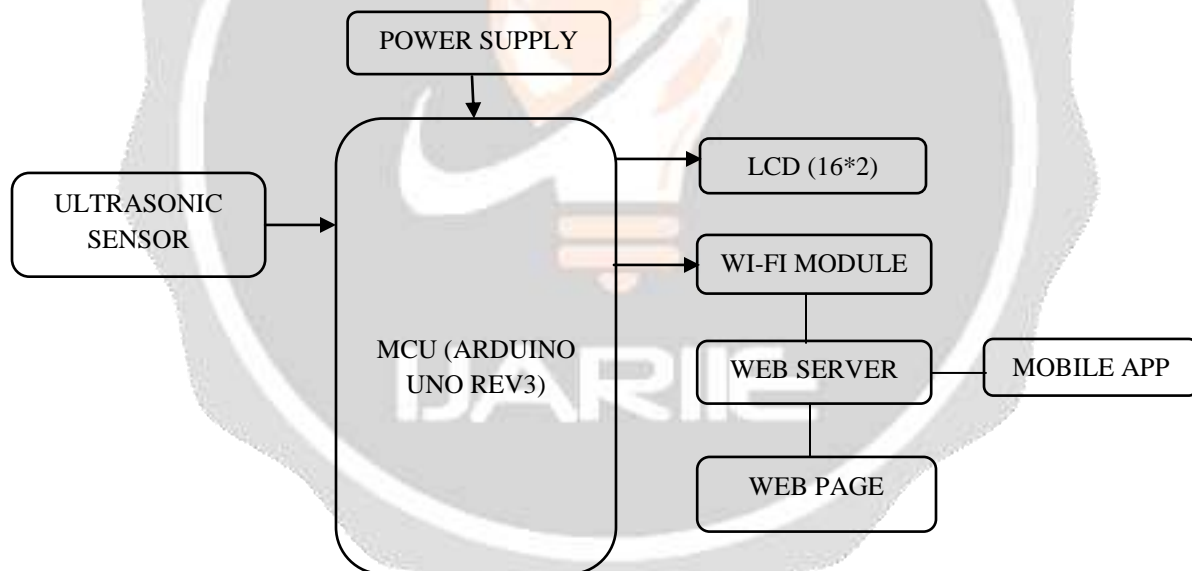
A big challenge in the urban cities is solid waste management. The garbage collecting authority in traditional waste management system doesn't know about the level of garbage in dustbin, if the dust bins gets full by garbage then it gets overflowed as well as spilled out from the dustbin leading to unhygienic condition in cities. People throw garbage on that dustbin which is already overflowed. Sometimes due to unclean garbage bins bad smell arises also toxic and unhygienic gases are produced which is way to support to the air pollution and to some

harmful diseases which are easily spreadable. It is very bad look of the city. Use of traditional system result in inefficient and time and money spending system.

## 2. LITERATURE REVIEW

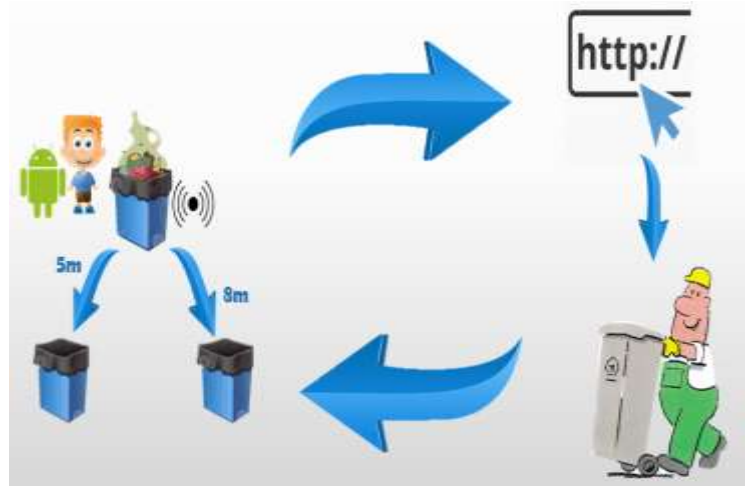
In paper [1] the system makes use of Load sensors, IR proximity sensor, RF module and web support. Web page gives a graphical view of the bins in color to show the level of collected garbage. In paper [2] author provided the concept of dynamic scheduling required for the cleaning of dustbin and led us to priority based cleaning of dustbins when the garbage level reaches its maximum.[3] Provided details of hardware required for detecting garbage level and additional details and designs needed for flow management of garbage.[4] Arduino best described as a single-board computer hardware and software are open source and extensible.[5] This paper make use of Image Processing to improve the waste management. It can prevent pollution and also prevent the consumption of the spread out garbage by the street animals. [6] The advancement of wireless technology provides a wide range of options. Electronic devices employed in container terminals reduce the manual effort, facilitating timely information flow and enhancing control and quality of service and decision made which technology of integrated logistics can be implemented and what remains to be addressed in the future.

## 3. PROPOSED MODEL



**Fig-1:** Block diagram of smart bin with control unit

The block diagram shows the complete system which contains the bins installed with sensor unit. The Arduino will get the level of the garbage from the ultrasonic sensor and send the information to the server via Wi-Fi module i.e. ESP 8266. In the service section, residents will throw the waste in a bin and that information with the sensors is collected and transferred to the administration section. The server will check for the threshold level and if the level is high it will send the notification. The web Server displays the details and status of bin, at real time. The same information is transferred to concerned authority so that accordingly the filled bins are timely evacuated.



**Fig-2:** Sending bin information on server

After the IOT field finding its grip in our lives. This is, however an original plan for designing a smart garbage bin with ultrasonic sensor, Arduino and Wi-Fi module for transmission of data. 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 to four not only makes it affordable but also achieves the same result.

#### 4. HARDWARE IMPLEMENTATION

- Arduino board(ATMEGA328P-PU)
- Ultrasonic Sensors(HCSR04)
- WIFI Module(ESP8266)
- LCD
- Power Supply

##### 4.1 Arduino board

The Arduino Uno is a microcontroller board based on the ATmega328. The Atmel Pico Power ATmega328/P/PU is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. The Arduino Uno can be powered via the USB connection or with an external power supply.

##### 4.2 Ultrasonic Sensors

Ultrasonic sensors are self-operated sensors which transmit ultrasonic waves into the air and detects reflected waves from an object.

##### 4.3 WIFI Module (ESP8266)

Wi-Fi stands for **Wireless Fidelity**. Wi-Fi is based on the IEEE 802.11 family of standards and is primarily a local area networking (LAN) technology designed to provide in-building broadband coverage ESP8266. Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network.

##### 4.4 LCD

Liquid Crystal Display(LCD) use 16x2 alphanumeric which means it can display Alphabets along with numbers on 2 lines each are containing 16 characters. Each character consists of 5x7 dot matrix. Contrast on display depends on the power supply voltage.

##### 4.5 Power supply unit:

When working with electronic circuit, one basic thing power supply is always required for proper working.

**5. EXPERIMENTAL RESULTS**



**Fig-3:** Project Title



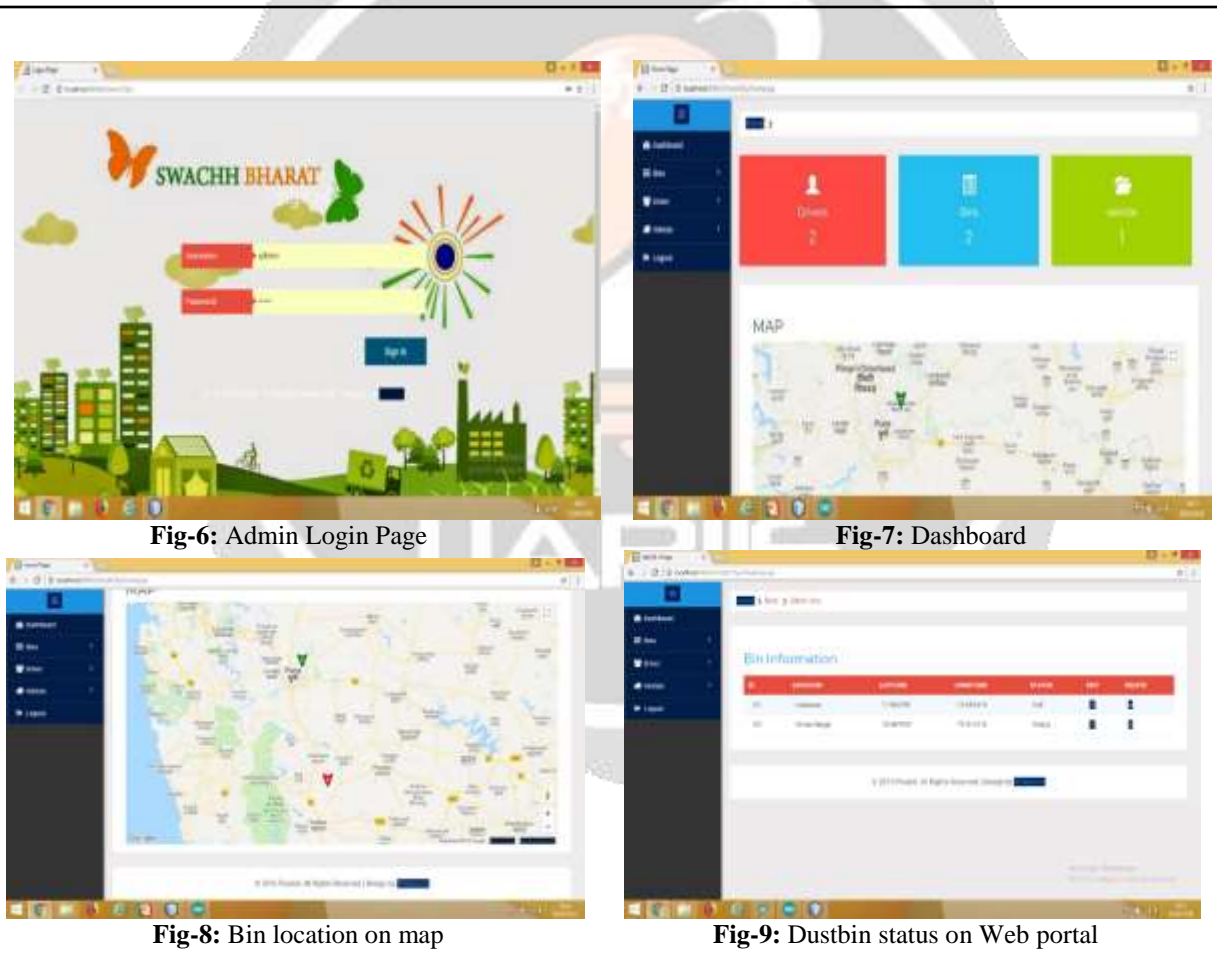
**Fig-4:** Sensor Value



**Fig-5:** Dustbin Status

**5.1 Test cases:**

- 1) When Empty 0% - Dustbin Empty
- 2) When Partial 40%-90% - Dustbin Half
- 3) When 90% (threshold) - Dustbin Full
- 4) When threshold crossed - Out of range



**Fig-6:** Admin Login Page

**Fig-7:** Dashboard

**Fig-8:** Bin location on map

**Fig-9:** Dustbin status on Web portal

**5.3 Android app (user)**

Track Bin status and location

## 6. APPLICATION AND ADVANTAGES

- E-Governance Based on Digital India.
- It makes our system transparent between Municipal Corporation, Workers and Public.
- The hardware costs involved are very low.
- Reduce Environmental Pollution and maintain Hygienic health conditions.
- It has advantages that the information of all smart dustbins can be accessed from anywhere and anytime by the concern person and he/she can take a decision accordingly.

## 7. CONCLUSION AND FUTURE SCOPE

This proposed system, integrates different sensing and communication technologies to monitor real time bin information. This system is good enough to carry out practically as it helps to collect the garbage from the garbage bins on time before the garbage overflows from that bin which can possess threat to the health of the people leaving in nearby area. This project can avoid such situations of overflowed dustbin and the message can be sent directly to the cleaning vehicle instead of the contractor's office (Authority). In Smart system design main is Development of web portal and applications for city administration, municipal staff and public.

## 8. ACKNOWLEDGEMENT

Our internal and external guides were the source of inspirations and their time to time encouragement led us to the place where we are. Without their full support and cheerful encouragement, the paper would not have been completed on time. Their suggestions with practical things have been extremely helpful. We would also like to thank all the teaching staff members of our stream and our college for their support.

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