

# IoT based Smart Garbage Monitoring System

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**Abstract— In the recent decades urbanization has increased tremendously. At the same phase there is an increase in waste production. Waste management has been a crucial issue to be considered. Smart bin is built on a microcontroller-based platform Arduino Mega 2560 board which is interfaced with Ultrasonic sensor and Rain drop Sensor. Ultrasonic sensor is placed at the top of the dustbin which will measure the height of the dustbin. The threshold height is set as 20cm. Arduino will be programmed in such a way that when the dustbin is being filled, notification will pop up in Blynk app.**

**Once the garbage reaches the threshold level, ultrasonic sensor will alert the required authority until the garbage in the dustbin is squashed. Once the dustbin is squashed, people can reuse the dustbin. Once these smart bins are implemented on a large scale, by replacing our traditional bins present today, waste can be managed efficiently as it avoids unnecessary lumping of wastes on roadside. Foul smell from these rotten wastes that remain untreated for a long time, due to negligence of authorities and carelessness of public may lead to long term problems. Breeding of insects and mosquitoes can create nuisance around promoting unclean environment. This may even cause dreadful diseases.**

## I. INTRODUCTION

Internet and its applications have become an integral part of today's human life style. It has become an essential tool in every aspect. Due to the tremendous demand and necessity researchers went beyond connecting just computers into the web.

These researches led to the birth of a sensational gizmo, Internet of Things (IOT). Communication over the internet has grown from user – user interaction to device – device interactions these days. The IOT concept was proposed years back but still it's in the initial stage of commercial deployment. Home automation industry and transportation industries are seeing rapid growth with IOT.

IOT technology can be explained as a connection between human's computers-things. All the equipment's used in our day today life can be controlled and monitored using IOT. A majority of process is done with the help of sensors in IOT. Sensors are deployed everywhere and these sensors convert raw physical data into digital signals and transmits them to its control center.

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. Safeguarding the environment using technology sources is needed at present. Majority of the public environment seems to be polluted with the waste material. Environmental problems are raised by modern cities for waste collection and disposal.

A big challenge in the urban cities is solid waste management. Majority of viruses and bacterial infections develop in polluted environment. Therefore, smart dustbin is a system which can eradicate this problem or at least reduce it to the minimum level.

Smart dustbin systems became essential for cities that aim to reduce cost and manage resources and time. Optimizing the process of trash collection is the main purpose of the smart solutions provided by industry. The purpose of this work is to present a cost-effective smart trash bin for localized and small-scale cases, such as small parks, university campus and hospitals.

## II. LITERATURE SURVEY

[1]. Prof R.M. Sahu et. al. has built a framework in which a Camera will be set at each garbage collection point alongside load cell sensor at base of the trash can. The camera will take continuous snapshots of the garbage can. A threshold level is set which compares the output of camera and load sensor. The comparison is done with help of microcontroller. After analyzing 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.

[2] Meghana et.al. proposed a system in which Infrared sensor is used, which can detect the level of garbage. IR sensor emits the light, which is invisible to naked eye but the electronic components can detect it. It consists of IR transmitter and IR receiver. Sensor senses level of the bin and gives the output of what level of garbage is filled. When the level in a bin reaches the threshold, the LED placed at the location of the bin starts blinking. When the blinking LED is clicked, a display opens showing the location of the bin,

status of the bin, data and time when the bin gets filled, mobile number and the text to send to the concerned person. But this system does not ensure whether garbage is cleaned or not and transportation cost is another issue.

[3]. Jaekeun et.al. proposed an IOT-based smart garbage system to reduce the amount of food waste. In an SGS, battery-based smart garbage bins (SGBs) exchange information with each other using wireless mesh networks, and a router and server collect and analyze the information for service provisioning.

Furthermore, the SGS includes various IOT skills considering user convenience and increases the battery lifetime through two types of energy-efficient operations of the SGBs: stand-alone operation and cooperation based operation. The proposed SGS had been functioned as a pilot project in Gangnam district, Seoul, Republic of Korea, for a one-year period. The test demonstrated that the normal measure of food waste could be decreased by 33%.

### III. DETAILED DESCRIPTION

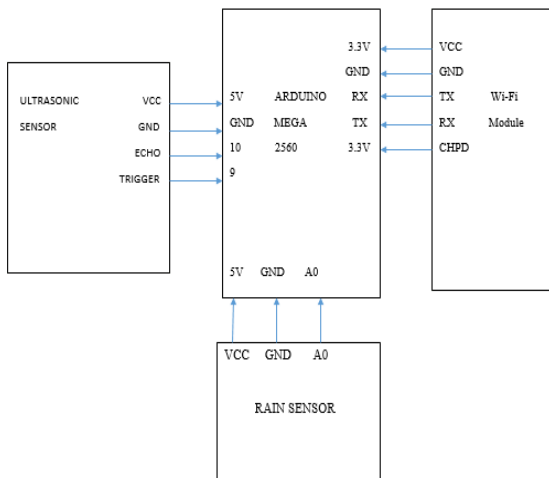


Fig. 1: Pin Configuration

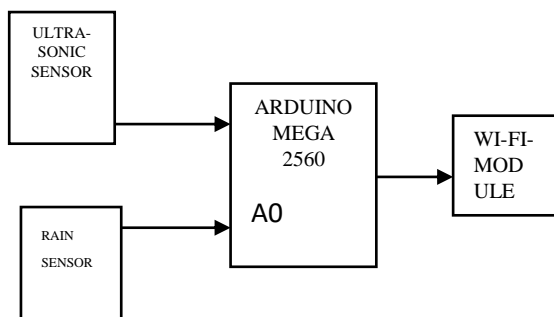


Fig 2: Block diagram



Fig 3. Flow chart

#### A) Hardware and Software Requirements

##### Hardware requirements:

- ULTRASONIC SENSOR
- RAIN SENSOR
- ARDUINO MEGA 2560
- Wi-Fi MODULE

##### Software requirement:

- BLYNK App

#### B) Blynk App

Blynk is an Internet of Things (IOT) server, Blynk is also a platform with iOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It's a digital dashboard where a graphic interface can be built for the project by simply dragging and dropping widgets. It's really simple to set everything up and it will start tinkering in less than 5 minutes. Blynk is not tied to some specific board or shield. Instead, it's supporting hardware of the choice. Whether Arduino or Raspberry Pi is linked to the Internet over Wi-Fi, Ethernet or this new ESP8266 chip, Blynk will get online and ready for the Internet of Things.

### IV. WORKING

- Garbage level detection is the done by ultrasonic sensor (HC-SR04). The ultrasonic sensor is placed on top of the dustbin facing the bottom.
- The sensor continuously emits the sonic waves, when the sonic waves hit the object and reflect back, the echo in the sensor senses the waves and calculates the distance of the object.
- Ultrasonic sensor senses the garbage level based on range i.e Range from 24 to 15 Low Level, Range from 15 to 5 Half filled, Range Less than 5 Complete filled.
- Rain sensor sense amount of wet consumption in waste material.
- And by using BLYNK android app we take longitude and latitude of the dustbin to detect the location of the dustbin.
- Status of the dustbin and type of waste (dry or wet) will be displayed in the LCD of BLYNK app.

## V. FUTURE SCOPE

- Implementation is done only for a single bin.
- Integration of many bins each with unique id can be done by implementing principles of IOT.
- Database can be created for each bin by using SQL technology.
- Automated system can be developed which is able to pick up waste in and around the bin, segregate them and put them in respective bins.

## VI. CONCLUSION

- This Smart Dustbin can contribute a lot towards clean and hygienic environment in building a smart city.
- Helps in avoiding over flow of garbage in residential area.
- But since the technology is new in India, proper awareness should be created among the public before it is implemented on a large scale.
- Otherwise, sensitive devices like sensors might be damaged due to rough action of the users.

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