

# Design of IOT Garbage Monitoring with Weight Sensing

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## ABSTRACT:

To manage the garbage efficiently has been always an ongoing task which needs laborious efforts of individuals engaged on ground level emptying the rubbish bins whenever they're full. The event of garbage bin getting full isn't strictly obsessed to a time pattern, instead it sometimes becomes rapidly full or sometimes requires over normal time to become full. This method monitors the rubbish bins and informs about the number of garbage collected within the rubbish bins via an online page. For this the system uses ultrasonic sensors placed over the bins to detect the rubbish level and compare it with the rubbish bins depth. additionally, we even have weight sensors attached below the rubbish bins. Thus, the system sends over the net the number of fill of the rubbish bins further because the burden of the fill of the rubbish bins. The advantage of this combo sensing is that the rubbish bin lifting weight also can be known by the authorities. If the rubbish bin isn't filled up, but still the burden of fill has reached the limit of what the rubbish lifting vehicles can obtain, the vehicles could even be immediately driven towards that bin for evacuation. The system makes use of node microcontroller unit, LCD screen, Wi-fi modem for sending data.

## 1. INTRODUCTION:

Waste management problem is an actual problem for the Indian cities and throughout the planet. In every city there are special organizations and firms engaged within the collection and removal of waste within the special refusal places. All such companies manage waste disposal management in line with the schedule or on demand of the purchasers. However, there are situations when the rubbish collection truck (GCT) arrives but garbage containers are half-filled; at the identical time the GCT doesn't arrive to the important full garbage container. this is often because of the actual fact that manager doesn't take into consideration the container fullness. because the population in our country is increasing day by day, a lot of trash are generated. Improper management of waste affects quality lifetime of the citizens. Thus, waste management is a vital issue to be considered.

### 1.1 Existing System:

In the existing system, if the bin is empty, the rubbish is collected on the daily regular basis by the municipal staff. As we see several times within the public places the rubbish bins are full thanks to the regular rise within the waste. due

to this, the rubbish is shrinking and producing the bad odor that tends to cause pollution and spread disease. that may cause the damage to human health. Finding garbage bin location is additionally one amongst the tasks especially for brand spanking new driver. GPS facility had been introduced to search out the situation and clean the dustbins to beat the aforementioned problem. Disadvantages of the prevailing systems is i) It requires more human resource to run the system. ii) The system is completely manual. iii) High costs. iv) It spreads bad smell and should cause illness to groups of people. v) Unhygienic Environment and appearance of the town.

### 1.2 Proposed System:

The system proposed focuses on the method of waste collection. It reduces the consumption of your time, and is an automatic process. The bin 's status is continuously monitored, and also the notification is distributed via the android application to the designated authority. the benefits of the proposed systems are i) Real time information of the dustbins. ii) Intelligent service management. iii) Improves the standard of the environment. iv) Cost management and also the improvement of the capital.

## 2. LITERATURE SURVEY:

In the paper title "Smart Dustbin-An Efficient Garbage Monitoring System," [1] have proposed an idea of between the existing dustbins and their population. This study and first part and the distribution of dustbins in some areas were taken palace of Dhaka city using averaging function and then the nearest neighbour functions of GIS. Remarkably, the procedure of the dustbins used today is one of the concerns that is concentrated on the smart dustbin. The insufficient of the existing dustbins will have the number of numbers which will be calculated in it. It has measured the extent of pollution which is caused by the existing dustbins was also one of the levels of the research part. It is found that the dustbins are burnt with wastes and has disturb and has cause pollution to the environment.

In the paper titled "IoT Based Waste Management for Smart City" [2], it is being proposed in the paper that has the introduction and the combination of the integrated system combined with an RFI, IGPS, GPRS, GIS and web camera which will solve the problem of waste They will help us to analysed the actual performance of the system. To the study of the paper we determine that the characterization of the

waste and the current system of management activities. The paper gives us the highlights and a overview of the municipal solid waste management (MSWM) system of Municipality and it concludes with a few suggestions, which may be beneficial to the authorities to work towards further improvement of the current management system.

In the paper titled "Pawar2International Journal of Engineering and Computer Science " [3] is being proposed system in that novel prototype of solid waste bin monitoring system using network. The architecture will use Zigbee and GSM (global service module) it has the communication technology as well and a set of chosen sensors it will monitor the status of garbage bins in real time. The paper is divided into three parts lower tier, middle tier, upper tier. The low tier will have the sensor installed into the garbage bins, the middle tier will have the collection and then it that will give the information to the control station. In the upper tier we will store the data for future use. An algorithm of an energy is used in the first-tier operation to collect the bin level.

In the paper "A Survey on Smart Garbage Management in Cities using IoT" [4] has proposed a dustbin which is interfaced with a microcontroller system in which we will having wireless systems along with central system showing the updated status of garbage, on web browser with html page by Wi-Fi Module. Hence the status will be updated on the html page. we have to reduce human efforts along with the enhancement of a smart city vision. Considering the modern technology, then we have a smart garbage bin can be costing but considering the amount of dustbin we all need in India, so there for then we have used sensors to reduce the cost and make it efficient in applications. And they used only a Wi-Fi module to send and receive data. But the consideration of weight sensor will have the detection of garbage level which was there in the dustbin. It will only detect the weight of the waste. The message can be sent directly to the cleaning vehicle instead of the contractor's office.

In the paper title "Garbage Monitoring System for Smart Cities," [5] proposed a model for which there is the collection of garbage in real time. There is a network which established using the sensors, which are placed into the garbage bin and have set at a level. Sensors will send a signal to the nearest vehicle driver if the level of garbage is crossed to empty the bin and hence the bin gets updated from time to time. Fig. 3 shows the Architectural Diagram, which consists major three modules; Sensor Module, in which sensors are used to sense the garbage levels once and connected to the Arduino board, Communication Module, in which Bluetooth is used for communication between the sensors and Arduino Uno board, and last module is Analysis and Monitoring Module, in which collected is sent to the admin for analysis.

In the paper title "MATEC Web of Conferences 97, 01098," [6], the level of the garbage in each bin is measured by using the sensor. The information of the sensor is then received

and processed by the Arduino Board. It will determine whether the garbage level has been reached to the threshold. For the research part, two marks have been made as a reference. The first is at the 70% and the second is at 90 %of the total bin height. If the garbage level in the bin is crossing the first reference level, then the first warning message is generated and sent to the municipality. Besides, the green LEDs responds to alert all the residents at every floor. Next, if the garbage level in the bin is crossing the second reference level, then the second warning message is generated and sent to the municipality. In that case, all the people will be alert when the red LEDs are at the high at their data pins.

In paper title "Multipurpose Garbage Monitoring System Using IoT" [7] which paper have consideration of waste management issues been solved by smart bin, interface of GSM and ultrasonic sensor with the help of microcontroller-based Arduino people get best solution to management of waste this is replacement of traditional dust bin into smart bin one. ARM 7 have been used for controlling Zigbee and global communication, it gives the indication and sending the message using GSM. Sensors are placed in the bin. This bin made and wireless sensor node attached to dustbin send the signal to road side unit real time show status of the bin. Other same signal from RSU reaches the Garbage Collecting Vehicle (GCV) which arrives the particular place to collect garbage. Many technologies use to recycling the garbage. For unhygienic condition people face more problems regarding to health Such situation is control by providing unique ID to garbage bin and identify ID number is given to each can if bin is fill then send SMS to the server. In this paper uses microcontroller ATMEGA 16 and certain sensors like PIR sensor, Hall Effect sensor, solar sensor, and LDR sensor. These sensors are connected to microcontroller through an interfacing circuit and an amplifier. The output could view in LCD display, sensor is sense the light and presence sensor sense car or human so light turn on. This paper is based on efficient of automatic street lighting system based on low-cost microcontroller controlling LED based on street automatically lighting levels control and light sensor, rain sensor, laser sensor and a set of the light emitting diode (LED) have been used brightness in of light will be directly proportional to number of traffic light Operate like ON or OFF accordingly during night and heavy raining or bad weather.

In Hiransahi Akminand [8] we are using two ultrasonic sensors which sense the level of garbage bin and two gas sensors which detect the harmful gases in the air. This sensors are connected to the AVR family microcontroller which is interfaced with LCD display which shows the status of bins. We also used Wi-Fi module which is used to transmit data for webpage applications. We are using one buzzer which gives beep whenever any dustbin is full. The whole system is powered by 12V transformer. Here, we are indicating Four levels Low, Medium, High and Full by using Embedded C programming. In first case when both the

dustbins are empty webpage and LCD will display Low level. Then according to the different levels of garbage it will show Medium, High or Full level on LCD as well as webpage. When any of the dustbin is full it gives beep and when both the dustbins are full it gives loud beep. Along with this the webpage and LCD will display the level of harmful gases in the surrounding. In this way Authority can collect the garbage whenever dustbin is full.

In paper titled "Bio-hydrogen, bio-methane, bioelectricity as crucial components of biorefinery of organic waste" [9], the aim of the work was to critically assess selected bioenergy alternatives from organic solid waste, such as biohydrogen and bioelectricity, to evaluate their relative advantages and disadvantages in the context of biorefineries, and finally to indicate the trends for future research and development. Biorefining is the sustainable processing of biomass into spectrum products viz. energy, materials, chemicals, food and feed. Series systems show a better efficiency than one-stage process regarding substrate conversion to the hydrogen and bioenergy. The dark fermentation also produces fermented by-products (fatty acids and solvents), so there is an opportunity for further combining with other processes that yield more bio energy. Photo heterotrophic fermentation is one of them: photosynthetic heterotrophs, such as non-Sulphur purple bacteria, can thrive on the simple organic substances produced in dark fermentation and light, to give more H<sub>2</sub>. Effluents from photo heterotrophic fermentation and digestives can be processed in microbial fuel cells for bioelectricity production and methanogenic digestion for methane generation, thus integrating a diverse block of bio energies. Several digestates from bio energies could be used for bio products generation, such as cellulolytic enzymes and saccharification processes, leading to ethanol fermentation (another bioenergy), thus completing the inverse cascade. Finally, biohydrogen and similar products came up to contribute in the improvements for solid organic waste management worldwide.

In paper titled, "Municipal Solid Waste Characterization and quantification as a measure towards effective waste management" [10] the aim of the study was to generate a comprehensive data at the regional and national level for use in planning and implementation of relevant waste management activities in Ghana. The study will also assess how well households in three different socioeconomic areas are able to separate their wastes into organic and non-organic wastes labelled on the bins as biodegradables, except papers (food waste, yard waste, wood and manure) and other wastes (paper, plastics, metals, textiles, rubber and leather and any other waste). Sorting and separation of waste using a one-way separation system which basically sorted into 'biodegradable (except papers)' and all 'other wastes' was tested in this study and the outcome averaged for each study area. From the questionnaire plastics, metals, textiles, rubber and leather and any other waste). Sorting and separation of waste using a one-way separation system

which basically sorted into 'biodegradable (except papers)' and all 'other wastes' was tested in this study and the outcome averaged for each study area. From the questionnaire administration results, out of 1000 respondents from all the study areas, 924 (92.4%) we're willing to separate their waste while 4.8% were unwilling and 2.3% did not respond. The reason for their willingness to separate waste was because it had the potential for a cleaner environment, it was a good waste management practice and good for recycling but for those not willing to separate waste it was because there was no motivation to do it. Sorting and separation into the correct bins were effective in most of the areas as it averaged above 80% for the "biodegradables except paper waste" and above 75% for the "other waste". In the municipality however all the sorting and separation were below 60%. A nationwide average of 84% was obtained for separation into the biodegradable waste bin/bag and 76% for the other waste bin/bag. The high separation efficiency is an indication that the one-way separation system employed was convenient for the participating households. This simple sorting and separation system could be recommended for communities learning to separate waste. It is therefore imperative for the MMDAs or city authorities or planners to start rolling out a source sorting process in the various cities. The organic fraction in the waste was the highest in the waste stream and ranged from 48% to 69%.

### 3. HARDWARE:

Node MCU, Ultrasonic Sensor, Load Cell, HX711 (Amplifier Module), I2C module, Liquid Crystal Display (LCD).

#### 3.1 Node MCU:

The ESP3286 Wi-Fi Module could be a self-contained SOC with built-in TCP / IP protocol stack which will provide connectivity to your Wi-Fi network to any microcontroller. The ESP3286 will host an application or discharge all Wi-Fi networking functions from another device processor. The ESP3286 Wi-Fi module may be a low-cost component with which manufacturers make module microcontroller wirelessly networkable. Wi-Fi module ESP 3286 could be a system-on-a-chip with 2.4GHz range capabilities. It running at 80MHz, uses a RISC CPU of 32 bit. it's supported the TCP / IP (Transfer control protocol). this can be the foremost critical component within the system because it conducts the IOT operation. it's ROM booting 64 kb, RAM instruction 64 kb, RAM data 96 kb. Wi-Fi device performs IOT operation by sending data from an energy meter to an internet site that may be accessed via IP address.

#### 3.2 Ultrasonic Sensor:

Ultrasonic sensor HC-SR04 uses sonar to live distance to an item. This provides excellent non- contact range detection

with high precision and a straightforward to use kit with reliable readings. It came with complete receiver and module ultrasonic transmitter. The time between the signal being transmitted and received allows us to understand the gap of an object.

### 3.3 Load Cell:

A load cell is defined as a "weight measuring system needed for electronic scales that display weights in Figure its." However, load cell is not limited to weight measurement in electronic scales. Load cell is a passive transducer or sensor translating the force exerted into electrical signals. They are also called "load transducers". The only load cells that predominate, however, are the load cells based on strain gages. The reason why strain gage-based load cells are broadly adopted is their characteristics: - Small size compared to other load-cell types. Long operating life due to lack of moving parts or other friction-causing components. Ease in production due to small number of components.

### 3.4 HX711 (Amplifier Module):

HX711 module could even be a Load Cell Amplifier breakout board for the HX711 IC that enables you to simply read load cells to live weight. This module used Twenty Four high precision A/D converter chip HX711. it's a specially designed for the high precision electronic scale design, with two analog input channels, the inner integration of 128 times the programmable gain amplifier.

### 3.5 I2C Module:

I2C Module has an inbuilt PCF8574 I2C chip that converts I2C serial data to parallel data for the LCD display. These modules are currently supplied with a default I2C address of either 0x27 or 0x3F. To determine which version, you have checked the black I2C adaptor board on the underside of the module.

### 3.6 Liquid Crystal Display (LCD):

The word LCD stands for liquid display. it's one kind of electronic display module employed in a large range of applications like various circuits & devices like cell phones, calculators, computers, television sets, etc. Such displays are chosen for light-emitting diodes and 7 segments in multi-segment configurations. the most benefits of using this module are inexpensive; simply programmable, animations, and also the display of custom characters, special and even animations, etc., isn't limited. A 16 LCD has two registers just like the register of knowledge and therefore the register of commands. The RS (register select) is primarily accustomed switch between registers. When the set of the register is '0' it's referred to as the register of commands. Similarly, it's called the info register when the register set is '1.'

## 4. CIRCUIT DIAGRAM:

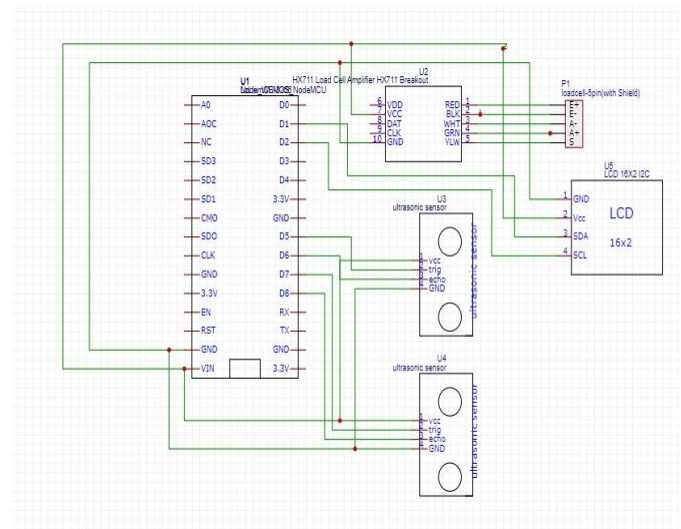


Fig. Proposed Circuit Diagram

## 5. BLOCK DIAGRAM:

Block Diagram which will indicate the actual flow of the proposed system to obtain the appropriate result.

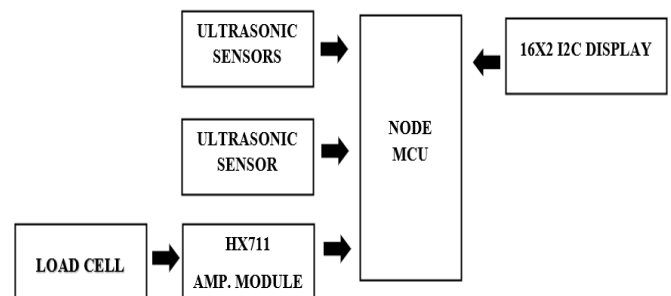


Fig. Proposed Block Diagram

## 6. FLOW CHART:

Flow chart which will indicate the actual flow of the proposed system to obtain the appropriate result.

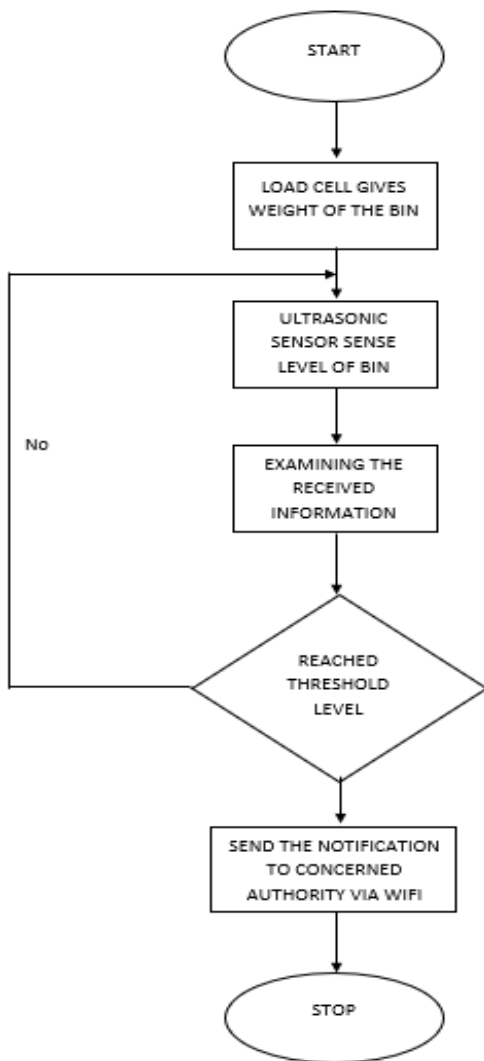


Fig. Proposed Flow Chart

7. PROCEDURE:

The system uses ultrasonic sensors placed over the bins to detect the rubbish level and compare it with the rubbish bins level. The system makes use of Node MCU, Load cell, LCD screen, Wi-Fi modem for sending data. The LCD screen is employed to display the status of the burden within the bins. Then system starts monitoring all the rubbish levels. Also, for better performance the WIFI connection is established over and yet again for every time of garbage monitoring. All the monitoring data is distributed over the mobile handset in order that the person concerned or the municipal officer can see the amount of the rubbish from anywhere.

8. RESULT:

1. When we switch on system the system gives notification on our mobile handset.

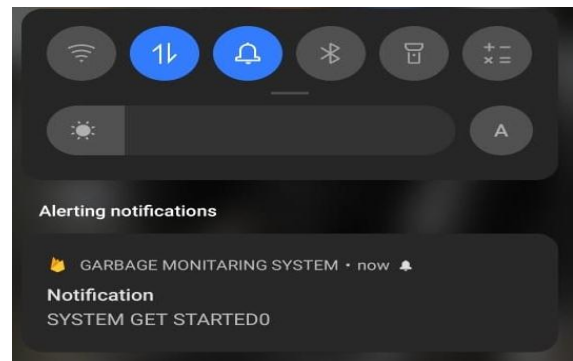


Fig. Result 1

2. When the garbage bin is filled or goes to its threshold level it gives notification like "your garbage bin is full".

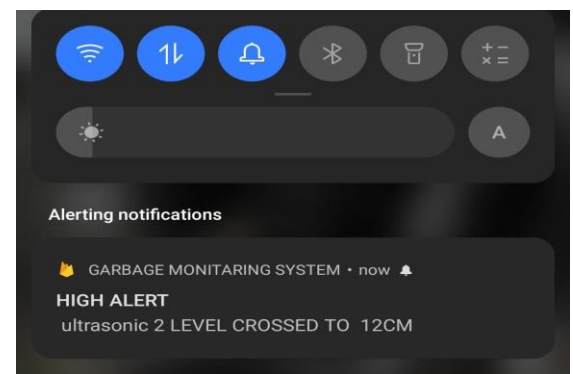


Fig. Result 2

3. And it also shows on our App that how much garbage bin is filled.

4. This system also gives the weight of the dustbin on our App and proposed observation table.

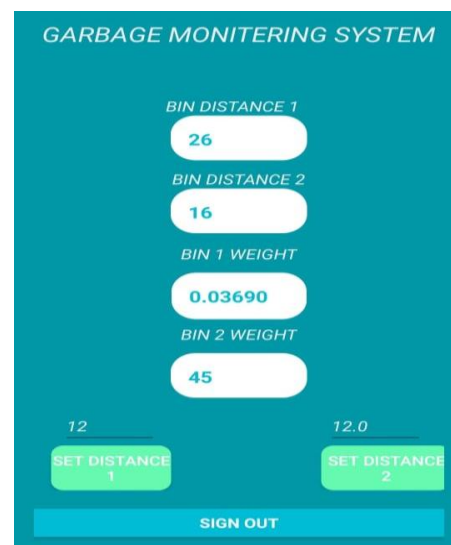
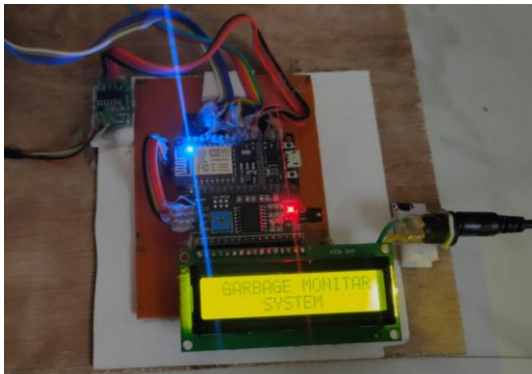
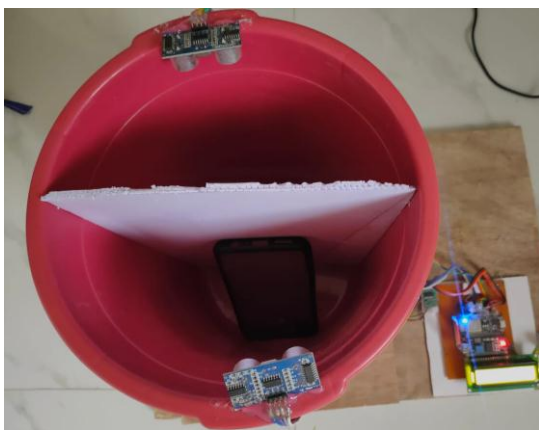


Fig. Application Interface

5. Bin 2 is just for reference. If in case we have to use 2<sup>nd</sup> bin then app shows value of that bin also.



**Fig. Actual System**



**Fig. Actual System**

**8.1 Observation Table:**

Condition of Bins	Bin 1 Weight (g)	Bin 2 Weight (g)	Bin 1 Level (cm)	Bin 2 Level (cm)
When the bin is empty	0.000	0.000	32	30
When the bin is half full	0.118	0.082	17	16
When the bin is full	0.428	0.121	7	5

**9. CONCLUSION:**

This project work is implementing a wise garbage management system using Ultrasonic Sensor, Weight Sensor, Node mcu and Wi-Fi. this method ensures dustbins are going to be cleaned soon when the extent of garbage reaches its maximum. If the dustbin isn't cleaned in an exceedingly reasonable period, the record shall be submitted to the upper authority which can take appropriate action against the contractor concerned. This program also helps track the false reports and thus can eliminate corruption within the overall system of management. This reduces the entire number of trash collection vehicle trips and thus reduces the general

costs related to the rubbish collection. In the end, it helps to preserve cleanliness in society. The smart garbage management system therefore allows collection of the rubbish more efficient.

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