

## GARBAGE MANAGEMENT OF SMART CITY USING IOT

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*Abstract - Internet and its applications have become an integral part of today's human lifestyle. 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 an Internet of Things (IoT). Things (Physical Devices) that are connected to Internet and sometimes these devices can be controlled from the internet is commonly called as Internet of Things. Now a days, there are a number of techniques which are purposefully used and are being build up for well management of garbage or solid waste. Sensors and IOT module i.e. Wi-Fi are the latest trends and are one of the best combination to be used in the project. Hence a combination of both of these technologies is used in the project. Here we are using raspberry pi. A threshold value is set in the IOT. In these we use ultrasonic sensor .When that value is met then will be sent to the officials through module about the over load and also to clear the garbage as soon as possible. The same thing is displayed on the LCD, which is connected to the output port of the controller. IOT through data available on web portal about all area dustbin.*

### I. INTRODUCTION

Swachh Bharat Abhiyan (English: Clean India Mission and abbreviated as SBA or SBM for "Swachh Bharat Mission") is a national campaign by the Government of India, covering 4,041 statutory cities and towns, to clean the streets, roads and infrastructure of the country.

In our system, the Smart dustbins are connected to the internet to get the real time information of the smart dustbins. In the recent years, there was a rapid growth in population which leads to more waste disposal. So a proper waste management system is necessary to avoid spreading some deadly diseases. Managing the smart bins by monitoring the status of it and accordingly taking the decision. There are number of dustbins are located throughout the city or the Campus (Educational Institutions, Companies, Hospitals etc.).

The aim of the mission is to cover all the rural and urban areas of the country to present this country as an ideal country before the world. With the proliferation of Mobile network devices such as smart phones, sensors, cameras. It is possible to collect massive amount of garbage. In the metropolitan cities it is not possible to check each and every place where the garbage dump yard is full or not. So we have introduced a new concept using ultrasonic

sensor. This is a sensor which intimates about the load placed on it. So that the garbage can also be checked in this way.

## II. OBJECTIVE

Many times, in our city we see that the garbage bins or dustbins placed at public places are overloaded. It creates unhygienic conditions for people as well as ugliness to that place leaving bad smell. To avoid all such situations we are going to implement a project called IoT Based Smart Garbage and Waste Collection bins. This system also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. If the dustbin is not cleaned in specific time, then the record is sent to the higher authority who can take appropriate action against the concerned contractor. This reduces the total number of trips of garbage collection vehicle and hence reduces the overall expenditure associated with the garbage collection. It ultimate helps to keep cleanness in the society. Therefore, the smart garbage management system makes the garbage collection more efficient the use of solar panels in such systems may reduce the energy consumption. These dust bin model can be applied to any of the smart cities around the world. A waste collecting and monitoring team which is deployed for collection of garbage from the city can be guided in a well manner for collection.

## III. LITERATURE REVIEW

### 1. Smart Dustbin

Municipality takes many measures to maintain the cleanliness of the city. One of which is establishing dustbins in regular distance for the convenience of public to discard items. Cleaning this garbage is an important function of municipality which is directly related to health issues. We have designed a model for a 'Smart Dustbin' which indicates directly that the dustbin is filled to a certain level by the garbage and cleaning or emptying them is a matter of immediate concern. This prevents lumping of garbage in the roadside dustbin which ends up giving foul smell and illness to people. The design of the smart dustbin includes a single directional cylinder and an Arduino Uno. The circuit to power up the mechanical devices is also assembled to obtain the desired simulation.

The design of the smart dustbin includes the pneumatically automated compressor for compressing the garbage, electrical circuit to control the garbage compressor and a microcontroller which is used to intimate the central hub of the municipality.

### 2. Efficient Garbage Disposal Management in Metropolitan.

Rapid increase in population, has led to improper waste management in metropolitan cities resulting in increased pests and spreading of diseases. An efficient method to dispose this waste has been designed with Wireless Sensor Networks (WSN) using VANETs. IEEE 802.11p has been adopted and multicast routing has been proposed to be implemented in Garbage Collecting Vehicle's (GCV) On Board Units (OBU) for effective communication. Road Side Units (RSU) and sensors have been made use of in the response system. Filling up of multiple bins at the same time and usage of reserve GCVs has been considered. The prototype VANET based efficient garbage disposal system is induced in a metropolitan city

environment and has been simulated in NS2 and the results are encouraging for implementation.

The system can be laid out in a large number in monitoring area to form monitoring sensor network. It also exhibits the function of forecasting by analyzing the obtained data neural network technology.

Real time monitoring of status of bins, estimation of amount of waste in and around them, surveillance for monitoring the movement of vehicles, optimization of routes and reallocation of bins according to the estimated waste, availability of Management Information System (MIS) reports for effective planning of resource schedule and providing transparency in civic administration are dealt with.

Each container is equipped with a Radio Frequency Identification (RFID) label having a unique identification code, the Electronic Product Code (EPC). Low frequency passive tags are proposed as they offer long term low cost solutions and are operational in extreme conditions resistant to environmental hazards. As the container gets loaded onto the truck, the RFID reader reads the serial number of the tag on the container, and at the same time, the Global Positioning System (GPS) receiver on the truck calculates its location using satellite data. The serial number of the tag, location, date and time are transmitted real time via the Global System for Mobile (GSM) network to the communication gateway of

the control server. After data processing, it is transferred to the Global Information System (GIS) terminal. The real time information can be shared with clients via a web based solution.

### 3. Smart Garbage Collection System In Residential Area.

Solid waste management is a big challenge in urban areas for most of the countries throughout the world. An efficient waste management is a pre requisition for maintain a safe and green environment as there are increasing all kinds of waste disposal. There are many technologies are used for waste collection as well as for well managed recycling. The Information gathering is big and cumbersome. The concurrent effects of a fast national growth rate, of a large and dense residential area and a pressing demand for urban environmental protection create a challenging framework for waste management. The complexity of context and procedures is indeed a primary concern of local municipal authorities due to problems related to the collection, transportation and processing of residential solid waste today the garbage collection is manual which takes a lot of efforts and is time consuming.

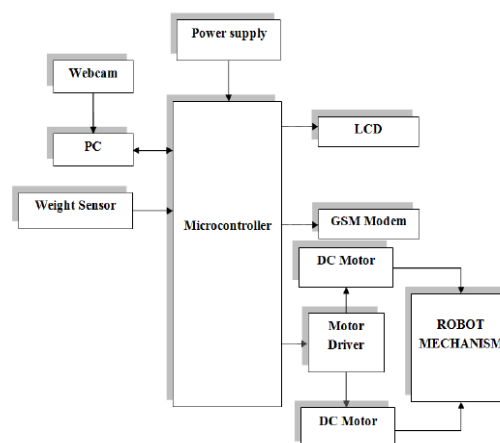


Fig 1: Block Diagram

In this project humans and vehicles were used to do that work and here we are using automatic technique to detect garbage level in Garbage Can. For that, ID number is given to each can. Also as soon as the Garbage Can is full / over flowing then a SMS is sent to the server from where all the garbage collection vehicles are allotted.

Also we have a Load cell based weigh sensor which will sense the weight of the Garbage Can and when the weight crosses the set point the SMS is sent to garbage collection centre. After the message is sent garbage disposal vehicle will arrive at that location. In this project it is demonstrated by robot mechanism.

#### IV. PROPOSED SYSTEM

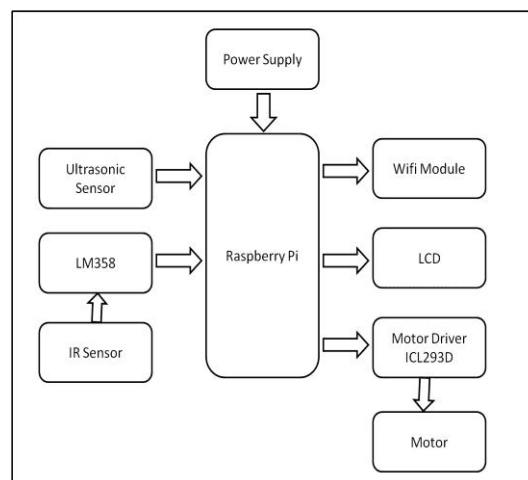


Fig. 1: Block diagram of the system

The Block diagram shows the different component used in the Smart Dust bin System is Power Supply, Ultrasonic Sensor, IR Sensor, Motor, Using Internet and Wi-Fi Module.

Ultrasonic Sensor is connected in dustbin it is used to detect the level of dustbin where dustbin is full or empty. Here we are using 4 different Ultrasonic sensors.

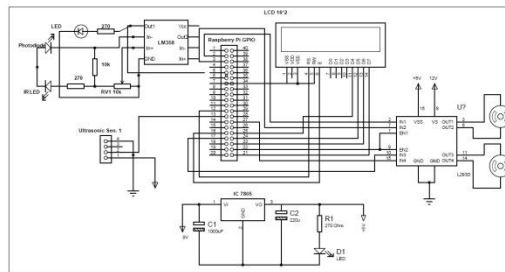
1. Dustbin empty 25% (when first level sensor gives output).
2. Dustbin half 50% (when first and second level sensor gives output).
3. Dustbin half 75% (when first, second and third level sensor gives output).
4. Dustbin full 90%(when all four level sensor gives output).
5. Dustbin heavy when threshold level of dustbin is crossed (ultrasonic sensor gives output).

IR sensor consist of IR LED (Transmitter and Receiver) and OP-AMP LM358 IC. When IR sensor emits the radiation, it reaches the object and some of the radiation reflects back to the IR receiver. Based on the intensity of light its output is defined. Here it is used as an object detection sensor.

In our system Motor is used for opening and closing of the Garbage bin lid. This can be done by forward and reverse direction rotation of motor. For smooth running, good speed regulation and operating of motor Drive IC L293D is used.

In all condition we receive data on web portal using Wi-Fi module and the same thing will be displayed on LCD screen connected to the Garbage Bin. Wi-Fi Module helps us to send the details of the dustbin at the receiver side.

## V. CIRCUIT DIAGRAM



## VI. SOFTWARE

### 1. RASPBIAN OS

Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run. However, Raspbian provides more than a pure OS: it comes with over 35,000 packages; pre-compiled software bundled in a nice format for easy installation on your Raspberry Pi.

### 2. EMBEDDED LINUX

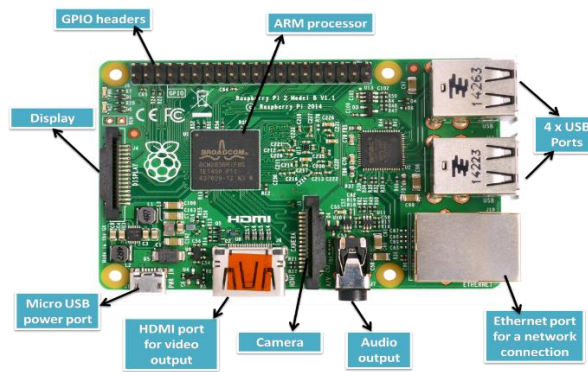
Linux OS running in embedded system is known as Embedded Linux. Linux OS occupy only up to 100KB space in memory. Now days most ES based on 32 bit processor like ARM, PowerPC, Cold Fire etc. have sufficient amount of flash and RAM memory. Developers new to embedded development often struggle with the concepts of and differences between native and cross-development environments.

### 3. PYTHON

Python is an interpreter, interactive, object-oriented programming language. It is often compared to Tcl, Perl, Scheme or Java. it is a scripting language like php or asp for developing applications Python is an interpreter, object-oriented, high-level programming language with dynamic semantics. Programming language consist some specific code which are require to write any program in the programming language. Because of computer programs are written in by which language is called Computer programming language.

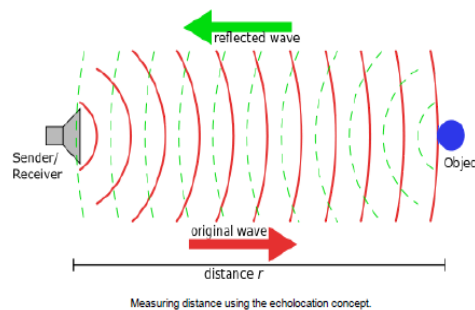
## VII. HARDWARE

### 1. RASPBERRY Pi



The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It's capable of doing everything you'd expect a desktop computer to do. The Raspberry Pi has the ability to interact with the outside world, and has been used in a wide array of digital maker projects, from music machines and parent detectors to weather stations and tweeting birdhouses with infra-red cameras.

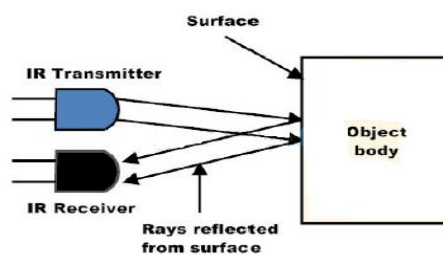
## 2. ULTRASONIC SENSOR



Ultrasonic sensors are based on the measurement of the frequencies above the human audible range. They operate by generating a high frequency pulse of sound and then receiving and evaluating the properties of the eco pulse.

Here ultrasonic distance measuring sensor is used as a level detection sensor.

## 3. IR SENSOR

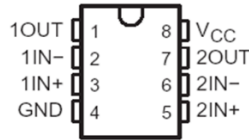


An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. These types of radiations are invisible to our eyes that can be detected by an infrared sensor.

The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the

IR LED. When IR light falls on the photodiode. The resistances and these output voltages, change in proportion to the magnitude of the IR light received.

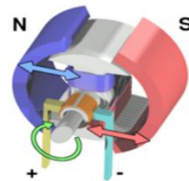
#### 4. IC LM358



The LM358 is a low power dual operational amplifier integrated circuit. The LM358 is designed for general use as amplifiers, high-pass filters and low, band pass filters and analog adders.

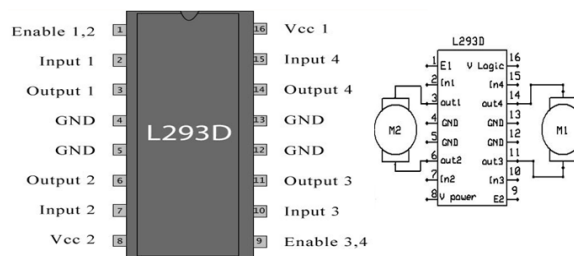
The LM358 consists of two independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltages.

#### 5. DC MOTOR



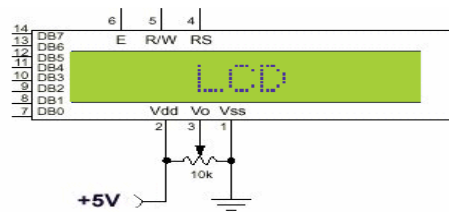
A DC motor relies on the fact that like magnet poles repel and unlike magnetic poles attract each other. A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. By switching the current on or off in a coil its magnet field can be switched on or off or by switching the direction of the current in the coil the direction of the generated magnetic field can be switched 180°.

#### 6. MOTOR DRIVER L293D IC



L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher current signal. This higher current signal is used to drive the motors.

#### 7. LCD



A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other. Many microcontroller devices use 'smart LCD' displays to output visual information.

## 8. WI-FI MODULE

Major part of our project depends upon the working of the Wi-Fi module. Wi-Fi Module helps us to send the details of the dustbin at the receiver side. The controller gives the details to the transmitter module (Wi-Fi module).

At the receiver section a mobile handset is needed to be connected to the Wi-Fi router so the details of the garbage bin is displayed on the web page and a mail notification (like email) will be sent to the respective Municipal / Government authority person.

## APPLICATIONS

- Domestic
- Hotels
- Homes
- Malls

## ADVANTAGES

- Ease of operation
- Low maintenance cost
- Fit and forget system
- Durability
- Accuracy
- Better quality of life

## CONCLUSION

This project work is the implementation of smart garbage management system using sensors, Raspberry pi and IOT module. This system assures the cleaning of dustbins soon when the garbage level reaches its maximum.

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