



## A SMART GARBAGE MANAGEMENT SYSTEM

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### **Abstract**

In our city many times the garbage bins or dustbins placed at public places are overflowing. It creates unhygienic conditions for people. Also it creates ugliness to that place. At the same time bad smell is also spread. To avoid all such situations, this system proposed Garbage collection bin overflow indicator using GSM technology. In this work, weight sensor is placed under the dustbin, when the weight reaches to the threshold value, an alert will be sent to the respective Municipal & Government authority person. A model was developed for Smart garbage collection and disposal which takes care of the disposal of wastes when it is full and maintains the healthy environment.

**KEYWORDS** – IoT Monitoring system, IR sensors, Microcontroller, Waste segregator.

### **1. INTRODUCTION**

Internet of things (IoT) consists of two words Internet and Things .The term things refers to various IoT devices with unique identities and capabilities to perform remote sensing and live monitoring of data. IOT devices are also enable to have live exchange of data with other connected devices and application either directly or indirectly and process the data and send the data to various servers. The other term internet is defined as Global communication Network connecting trillions of computers across the planets enabling sharing of information. The Internet of Things (IoT) describes the network of physical objects which are embedded with sensors, technologies and software for connecting and exchanging data with other devices over the internet. An IoT device consists of various interfaces for making connectivity to other devices that can either be wired or wireless.

The total amount of waste that was dumped globally in the year 2007 was a whopping 2.12 billion tones increasing by 100 million tons from 2006. The segregation of the waste followed by the transportation and disposal of the waste needs to be very precise and managed properly so as to avoid the risk to heal than safety of the public. Waste segregation is an absolutely necessary stage in waste management. Most of the waste is sent directly to the landfills without proper sorting and this has caused a huge loss for us. By properly distinguishing wet, dry and plastic waste allows us to recycle it more efficiently and saves us a lot of money and resources. Generally, they have a regular schedule of picking up these garbage bins or dustbins. This schedule varies as per the population of that place. It can be once in a day or twice in a day or in some cases once in two days. However, that in case there is some festival or some function,

lots of garbage material is generated by people in a particular area. With the advent of the plastic ban and people having so many plastics in their households, SMART BIN can help to dispose the waste properly and efficiently without any problems. Also, the wet waste can be used as compost and some of the dry waste can be recycled. SMART BIN identifies the type of waste and segregates it using the techniques mentioned. This segregation by a machine thus brings an end to the segregation done by humans, which is again a filthy job as no human should touch such toxic and dirty waste thrown by us and also sometimes this segregation process is expertise. These smart bins also tell us the dustbins complete to take out the garbage. Smart Bin will also have an automatic door at the top of the bin which opens when a person comes to dispose any waste thus solving the challenge of sanitation. Another important issue we face is we do not actually count for what kind of garbage we throw. The smart bin gives us a weekly analysis through the app connected to the bin about the type of garbage thrown. Along with this, the smart bin will also provide solutions to what kind of garbage can be used as compost or which garbage can be recycled or reused. This solves the important issue of not wasting resources. So The Smart Bin mainly focuses and helps in getting us a step closer to achieving the Reduce, Reuse and Recycle.

As the world is in a stage of scaling up still there is one major problem, waste is the foul smell around us and we have deal with it most often that is Garbage. Most of the time we see garbage bin is overfull still some people keep on adding garbage over it which makes the surrounding look untidy. This unclean surrounding leads to cause number of diseases as large number of mosquitoes and insects procreate on it. Managing waste appropriately has always been an issue not only in India but also in some other parts of the globe. Therefore, such a system must be developed which can reduce this problem at minimum level. With this growing generation our prime need begins with cleanliness and cleanliness begin with our surroundings. So, we have to say no to the old traditional method of collecting and segregating waste manually which is not an efficient method, it also consumes a lot of time and workload increases. In India total 60 million tones of waste are generated per year. Ten million tones garbage is generated only in metropolitan cities of India which is a big amount of waste and it is a serious concern for the authorities to manage it efficiently without much workload. The ideology of “waste management hierarchy” has been accepted by most nations as the step for developing municipal solid waste (MSW) control policy. Thus, we have propounded a constructive garbage management system which helps to monitor the level of waste in the bin. Once the bin is 90% full, it will send the notification to the nearest truck driver to collect the waste as soon as possible which will prevent the overflow of that dustbin that will help to keep that area hygienic. This contributes a solution to achieve automatic management of waste at the initial levels i.e. where the wastes are produced. If the waste items are segregated properly at their initial level, a major portion of the waste management cycle is covered. The utilization of automation in segregation of waste items can significantly enhance its efficiency and at the same time reduce the health hazards related with manual segregation.

## **2. LITERATURE SURVEY**

An efficient technique to separate the waste easily that has been designed [1]. This technology focuses on managing waste effectively. This will be helpful to the society at primary level for segregating waste initially as it will make the process easy and less time consuming.

To maintain public cleanliness and health a smart garbage system [2] is developed. This process

is done by the ultrasonic sensor interfaced into the Arduino UNO to check the level of garbage filled in the dustbin and sends the alert message to the municipal web server if garbage is filled. After the dustbin is cleaned, the driver confirms the task of emptying the garbage with the use of RFID tag. The RFID is a technology used for verification process and it also enhances the smart garbage alert system by providing automatic identification of garbage filled in the dustbin and sends the cleaning status to the server.

A smart waste management system is developed using LoRa communication protocol and Tensor Flow based on deep learning model [3]. LoRa is used to send the sensor data and real time object detection and classification is done by Tensorflow. The bin contains several compartments to separate the waste materials including metal, paper, plastic and general waste compartment are controlled by the servo motors.

The IOT based Garbage monitoring system [4] is a innovative technique which help to keep the cities clean. This system monitors and checks the garbage bins and gives information about the level of garbage collected in the garbage bins through web page. It also indicates the status of toxic gas formation inside the garbage bin and the weight of the bin. For this, the system uses ultra sonic sensor placed over the bins to detect the garbage level and compare it with the level of the garbage bins depth.

Garbage Monitoring system [5] monitors the garbage bins using ultrasonic sensors placed over the bins to detect the garbage level and compare it with the garbage bins depth. The system uses Arduino family microcontroller, LCD screen, WiFi modem for sending data, a buzzer, GSM and Ultrasonic Sensor.

### 3. PROPOSED WORK

Due to our busy schedule, it is impossible to spend time for waste disposal. So, a model was developed for Smart garbage collection and disposal which takes care of the disposal of wastes when it is full and maintains the healthy environment. The proposed model uses sensors to gather the data and monitor the number of wastes and motors to efficiently dispose of them. The proposed system provides solution for waste management problems by providing: continuous monitoring of wastes, complete disposal without human efforts. In the proposed system, the garbage dustbin in areas is monitored efficiently. The garbage bins overflows create many problems.

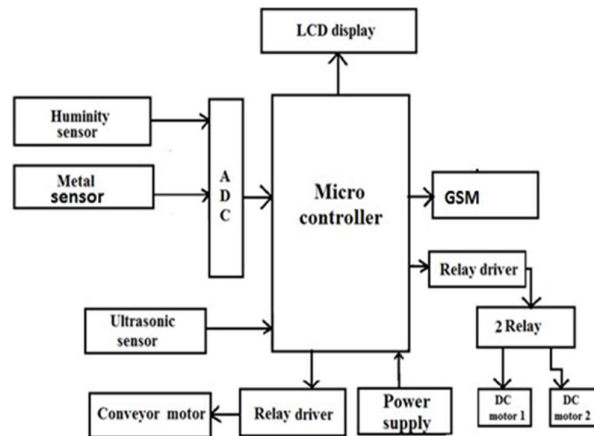


Figure 1. Block diagram of garbage management System

Here ultrasonic sensors are used to identify wastage level in the dustbins using three types of segregations process metal (metal sensor), Recycle (humidity) sensor and non recycle waste. Segregations process to conveyer to splitting individual bin waste dc motor. If waste level is exceed, the information sent to control station help of GSM.

#### 4. COMPONENTS IN THE GARBAGE MANAGEMENT SYSTEM

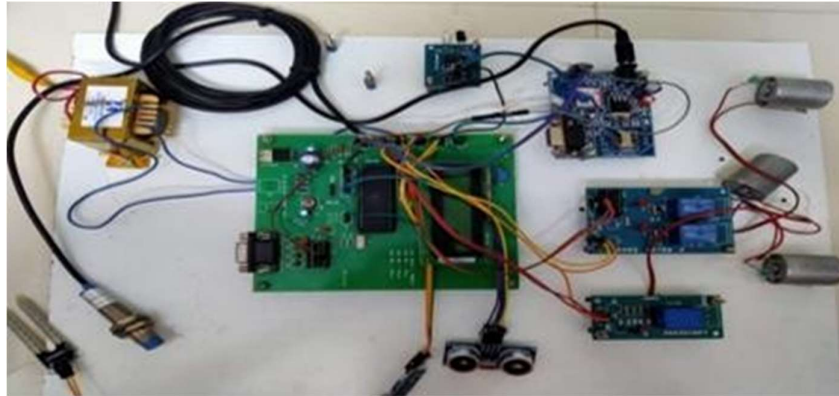


Figure 2. Implementation of garbage management

##### i. ARDUINO UNO AT89S52 MICROCONTROLLER

The Arduino Uno is a microcontroller board based on the ATmega328 with 14 digital input/output pins, 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header and a reset button.



Figure 3. AT89S52 microcontroller

The AT89S52 is a high-performance, low-power CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with 8051 instruction set. The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the Industry-standard 80C51 instruction set and pin out.

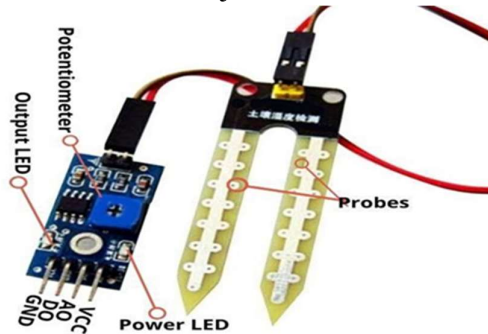
The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmers. The Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

The AT89S52 provides 8K bytes of Flash, 32 I/O lines, 256 bytes of RAM, Watchdog timer, three 16-bit timer/counters, two data pointers, a six-vector two-level interrupt architecture, on-

chip oscillator, a full duplex serial port, and clock circuitry. The AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, serial port, timer/counters, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

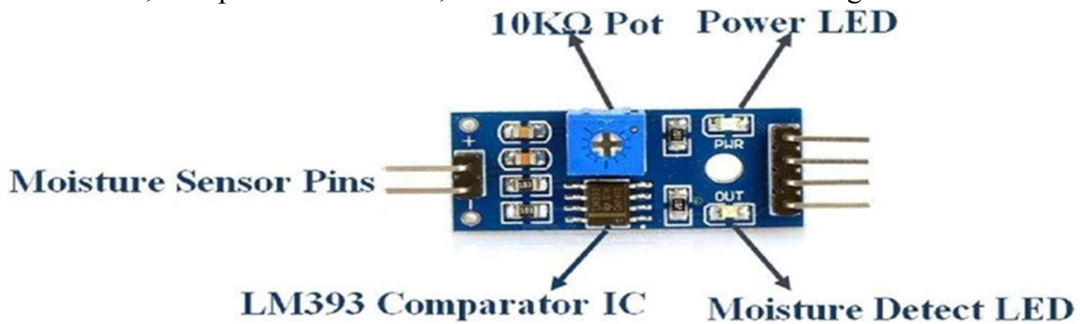
**ii. MOISTURE SENSOR:**

This moisture sensor module is used to detect the moisture. It measures the volumetric content of water inside the object and gives us the moisture level as output. The module has both digital and analog outputs and a potentiometer to adjust the threshold level.



**Figure 4. Moisture Sensor**

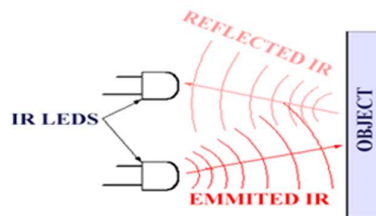
This Moisture sensor module consists of a Moisture sensor, Resistors, Capacitor, Potentiometer, Comparator LM393 IC, Power and Status LED in an integrated circuit.



**Figure 5. Moisture Sensor Module**

**iii. INFRARED SENSOR**

An Infrared sensor emits or detects infrared radiation to sense certain characteristics of its surroundings. Infrared sensors are also capable of measuring the heat being emitted by an object and object and detecting motion.



**Figure 6. Block diagram of Infrared Sensor**

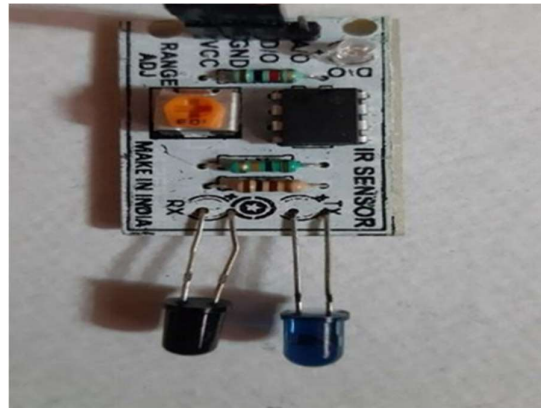


Figure 7. Infrared Sensor

#### iv. ULTRASONIC SENSOR

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity

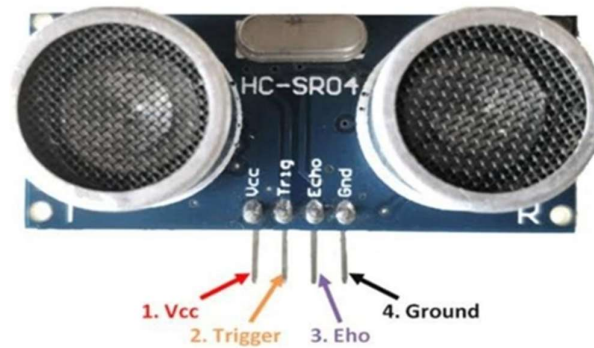


Figure 8. Ultrasonic Sensor

#### v. RELAY

Relays consist of three pins normally open pin, normally closed pin, common pin and coil. When coil powered on magnetic field is generated the contacts connected to each other. The relay is a component having three edges that are VCC (voltage), GND and TTL attached to the Nodemcu. I used three relays, the first and second one gets the soil moisture data from the Nodemcu, it is "ON" when the soil is dry (soil moisture voltage is high), in order to operate the watering pump, and it is "OFF" when the water level is enough in the soil (soil moisture voltage is lower). The third relay turns on the fan when the temperature is very high.

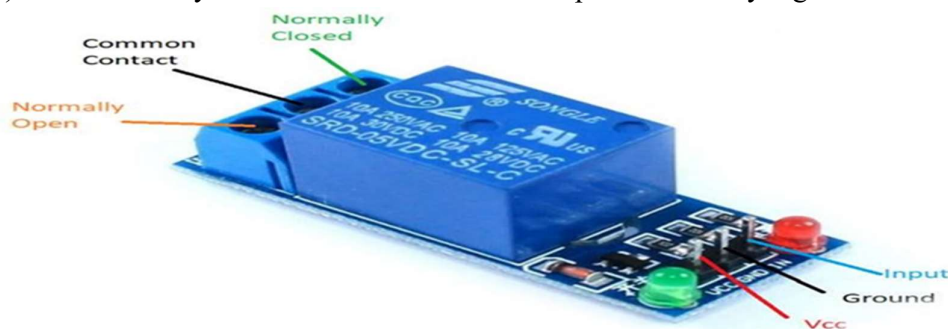


Figure 9. Relay Configuration

**vi. EXTERNAL AC ADAPTER**

A 12V AC adapter can also be considered as a component in the circuit for external power supply for the circuit which enabled the circuit to be switched ‘ON’ in case if the battery power is very low for use. The adapter can directly act as an AC/DC convertor to provide pure DC current externally to the circuit.



Figure 10. External AC Adapter 12V

**5. CONCLUSION:**

The Smart Bin allows us to effectively and cleanly dispose of the waste. The automatic door opening system ensures that garbage disposal by the humans is completely hands-free and therefore extremely hygienic since there is no contact established with the bin. The waste thrown away is sorted according to its capacitance. The wet waste has significantly larger capacitance than dry waste and plastic and hence it is easily distinguishable. The plastic has different reflective properties than other dry waste and therefore infrared spectroscopy is the most suitable method to distinguish plastic from other dry waste.

**References:**

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