



## Smart Waste Management System with IoT

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### ABSTRACT: -

With rapid increase in population, the issues related to sanitation with respect to garbage management are degrading immensely. It creates unhygienic conditions for the citizens in the nearby surrounding, leading to the spread of infectious diseases and illness. To avoid this problem, IoT based “Smart Waste Management” is the best and trending solution. The revolution of the Internet and the Internet of Things (IoT) has led to the development of numerous devices, such as radio-frequency identification tags, sensors, and other intelligent devices. Devices with significant computational capabilities and those that are transformed into intelligent objects are used to monitor and gather information about the environment of a city, thereby leading to smart cities.

**Keyword: - Arduino compiler, Keil software, Arduino UNO, Arduino IDE**

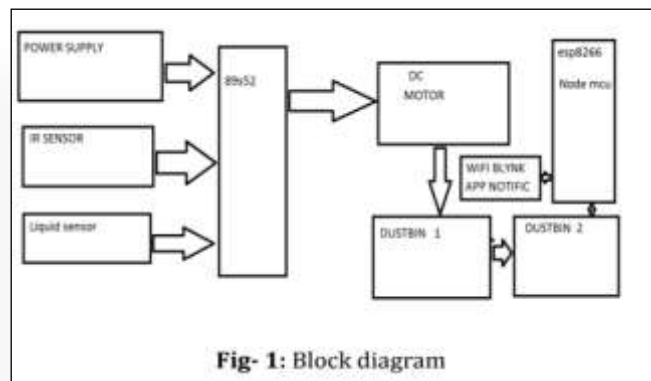
### 1.INTRODUCTION

Management and disposal of waste is a challenge in today's world. dumping of garbage wastes at open landfill sites is common method of disposal. disposal method of dumping in open land sites has an adverse effect on environment. Uncontrolled dumping of waste on borders of towns and cities has created overfull landfills which are not only impossible to reclaim because of random manner of dumping but also has serious environmental implications. When viewed on a larger scale, poor recovery rate has impeded growth of country as well as economy of nation. Smart cities are covering population that are seeking best lifestyle and fulfilling ir needs. Through smart cities, necessary modern facilities using ICT emerging technologies such as internet of things (IoT) had been fitted to ensure sustainability of city. In perspective of waste management, different IoT based solutions also had been proposed as an alternative to monitor and to ensure health of societies It will be very useful and can be installed in trash cans at public places as well as at home. As we know that it is hard for MNC to take care of garbage in a city area at regular interval of times. It is unknown to the garbage disposal company and municipal corporation of the city that how much the garbage bins are filled and which one needs to be picked up first or which ones are empty.

IoT is not only proven effective in-home automation, smart city, but also admiring in social Maintaining the Integrity of the Specifications. Nowadays the applications of IoT are developing vastly. Collection and decay of waste in the smart (process and method) benefit from the waste are maximized and the actual waste are minimized expertly.

Our project is a needed solution of this problem.in this project we have made a monitoring module which will calculate that how much the bin is filled and does it need to carry out and IoT based smart waste clean management system checks the waste level over the dustbin by using sensor systems. In this system we detect the wet and dry waste and separate this kind of waste by automation.

This project reduces lot of time and man power. Simple block diagram of the project for smartbin is present in below:-



## 2. LITERATURE SURVEY

After the IOT field found its grip in our lives. This is a modern plan for designing a smart garbage bin one by one very well within the following sections. This is not an original idea, IOT based dustbin was implemented and effectuated much before. Some authors presented systems where the sensors in the bin checked if the bin are filled up to the brim or not. If it was filled an automated message was sent to the server end of the system, through the Arduino SIM module, which used the application of the Arduino board. Once the server received the message it forwarded the message to the worker in charge, if the worker was available, he would notify his/her presence by accepting the work and would reach the required destination. If the worker was not available, the work would be transferred to another worker.

The main controller that is the Arduino AT mega 328 microcontroller primarily based board. It operates on 16 MHz clock frequency. Its operational frequency of 5V and input voltage as 7-12V. It consists of total fourteen digital I/O pins and analog I/O pins. AT mega 328 has 32kb of nonvolatile storage 5KB memory is employed by boot loader. Arduino UNO board consists of external power provide reset switch USB plug etc.

Arduino is one of the best designed single board computers and it is easy to be handled by the person who is initially not an expert in the field of electronics.

We are working on smart garbage management system using IR sensor, microcontroller and Wi-Fi module. This system assured the cleaning of dustbins soon when the garbage level reached its maximum.

### 2.1 FLAWS IN THE EXISTING SYSTEM:

The main problems of the existing solid waste collection process and management system are as follows:

- More complications in the processing.
- Many controlling units linked with each other
- Higher implementation cost

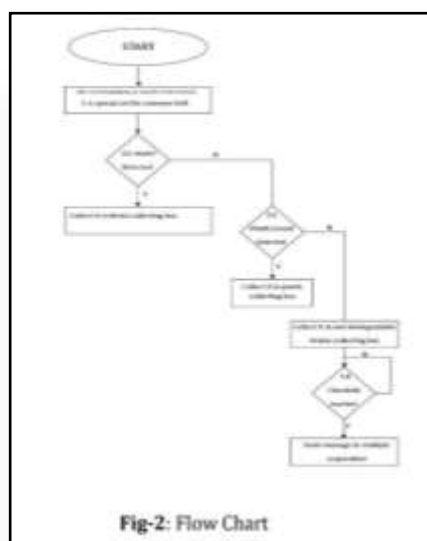
### 2.2 PROPOSED SYSTEM:

Our project work on smartbins using IoT based smart waste clean management system checks the waste level over the dustbin by using sensor systems. This paper proposes a smart alert system for garbage clearance by giving an alert signal to the municipal webserver for instant cleaning of dustbin with proper verification based on level of garbage filling. Once it detected immediately this system alert the concern authorized through GSM/GPRS. Manage the waste in different category of trunk by using automation. In this system we detect the wet and dry waste and separate this kind of waste by automation.

## 3. METHODOLOGY

This system is a basic obstacle distance measurement. It is built around a ESP8266 microcontroller. It is connected to an IR sensor, a moisture sensor, a resistor, and a pair of external terminals. The whole system is powered by a 5V micro-USB charger so that it is easily portable. Once you have code you can attached all the exterior part. With the help of breadboard, we can make it easy. This will allow you assemble temporary link to text everything out and 2<sup>nd</sup> we create garbage alert system which create smartbins.

**Flow chart for smartbin: -**



**SOFTWARE TOOL: -**

Software Specification – ARDUINO COMPILER, KEIL SOFTWARE, ARDUINO IDE

Language – Embedded C

**HARDWARE TOOL: -**

ESP8266 NODE MCU WIFI, AT 89S52 MICROCONTROLLER, MOISTURE SENSOR, LCD DISPLAY, IR Sensor, ARDUINO UNO, ULTRASONIC SENSOR HCSR04, GAS SENSOR, TEMPERATURE SENSOR LM35

**3.1 COMPONENT DESCRIPTION****ESP8266 NODE MCU WIFI**

The ESP8266 Wi-Fi module is used to give any microcontroller access to your Wi-Fi network. The ESP 8266 Wi-Fi module consumes the power up to 3.3-volt direct current. The RAM used by ESP 8266 is 32KB instruction and 32 instruction cache RAM. ESP 8266 can also be used in place of Arduino in many cases so it is used widely and it is of very low cost.



Fig-3: ESP8266 Node MCU

**AT 89S52 MICROCONTROLLER**

The AT89S52 is made in such a way that it supports two software-selectable power-saving modes and it also provides static logic for operation. The AT89S52 is an 8-bit microcontroller with 8000 bytes of on-chip flash memory. It is similar to the 8051 but the manufacturer is ATMEL.

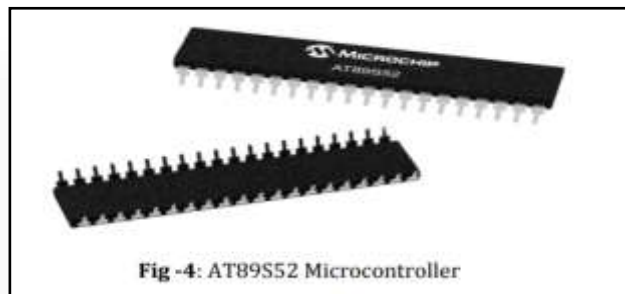


Fig -4: AT89S52 Microcontroller

**MOISTURE SENSOR**

The purpose of a moisture sensor is used to detect whether substances are wet or dry. This sensor uses two probes to pass current through the substances, and then reads the resistances to get the moisture level. The power supply is 3.3V or 5V. The ranges for values of dry (0-300), humid (300-700), and for water (700-950). It is easy to use and more compatible.

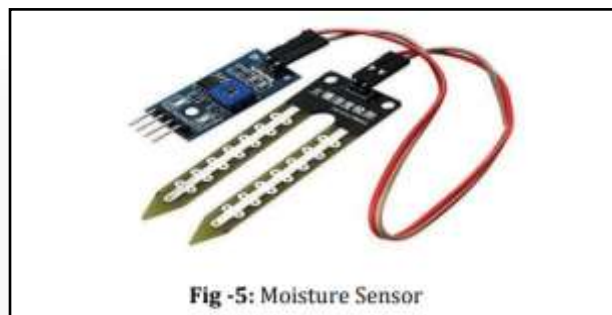


Fig -5: Moisture Sensor

### ULTRASONIC SENSOR HCSR04

The Ultrasonic Sensor sends frequency sound pulse of high range and then measures the time taken by the sound to reflect back. The front side of the sensor has 2 openings. Ultrasonic wave is transmitted by one opening and received by the other. The distance of the object is calculated by the difference between sending and receiving sound pulse.

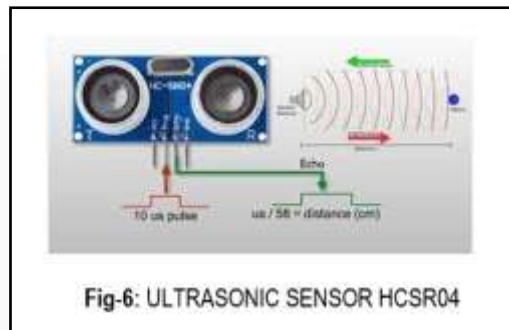


Fig-6: ULTRASONIC SENSOR HCSR04

### GAS SENSOR

Different types of gases present around the air is detected by gas sensor. Here, it is used to detect or sense the harmful gases present around the dustbin and shows the % of harmful gases. It is cheap and has variety of applications like harmful gases detection.



Fig-7: gas sensor

### LCD DISPLAY

An LCD is an electronic display unit which uses liquid crystal to build a visible image. The 16x2 LCD display is a very basic module commonly used in DIYs and circuits. In this LCD each character is displayed in a 5x7-pixel matrix.

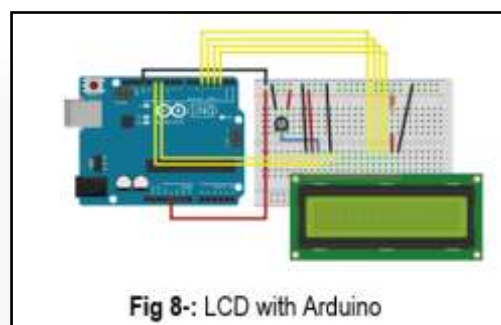


Fig 8:- LCD with Arduino

### IR Sensor

It is an electronic device that can emit the light in order to detect some object of the surrounding. IR sensor can open and close the dustbin lid automatically.

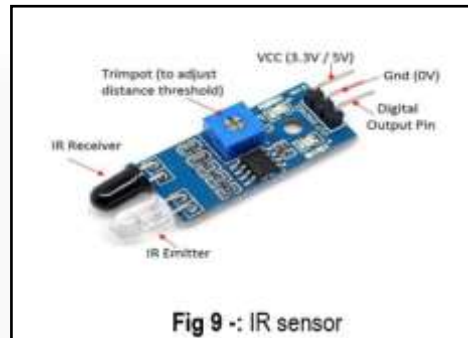


Fig 9 -: IR sensor

#### AURDINO UNO

Arduino UNO is the microcontroller is used here. It can be easily communicated with computers. The Atmega328p is microcontroller based on an 8-BIT AVR RISC. 32 kb flash memory is provided here with read-write capabilities. The Arduino UNO is categorized as a microcontroller that uses the ATmega328 as a controller in it. The Arduino UNO board is used for an electronics project and mostly preferred by the beginners. The Arduino UNO board I type of Arduino board only. The Arduino board is the most used board of all Arduino boards. The board contains 14 digital input/ output pins in which 6 are analog input pin, one power jack, USB connector, one reset button, ICSP header, and other components.



Fig 10 -: Arduino UNO

#### TEMPERATURE SENSOR LM35

LM35 is a temperature sensor where its output proportional to the temperature. Oxidation and other processes are not carried out here as the sensor circuitry is sealed. LM35 measures more accurate temperature as compared to thermistor.

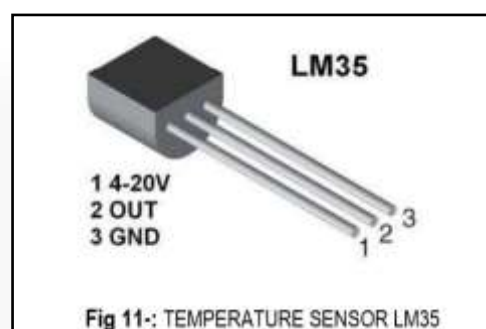


Fig 11 -: TEMPERATURE SENSOR LM35

#### WIFI MODULE ESPN8266

The ESP8266 WIFI Module is used here. It has integrated TCP/IP protocol stack with self- contained SOC which easily gives any microcontroller access to your WIFI network. The ESP8266 can host an application or offload all Wi-Fi networking functions from another application processor.



Fig 12-: WIFI MODULE ESPN8266

### 3.2 WORKING

As we can see from the above diagram its divided in following parts for garbage alert system which creates smartbins:

- Garbage monitoring module
- Web server
- Mobile application

The monitoring module will exchange signal with the sensors and sends the data to the server and mobile application. The monitoring module consist of Arduino, ultrasonic sensor, temperature sensor, gas sensor, WIFI module. The ultrasonic sensor will measure the level of the garbage comparing it with the height of the bin. These sensors will work accordingly and Arduino will read the data from all the sensors.

The web page here is made to show the real time status of the garbage in the dustbins to the user monitoring it. The web page will have access only by the municipal corporation people and it will be showing the graphical representation of all the dustbins and all the data related to its condition. Web page send notification for that specific dustbin demanding cleaning process.

The mobile application has two logins, one is driver login which can be used by the drivers of municipal corporation to check the status of the bins and also, they will be getting notifications on that application by the web page admin. Another is the user login which is made for the use of common people to know the locations and status of the bins placed in their area.

### 3.3 ADVANTAGES

The proposed plan has many advantages, it is also cogent enough to be implemented in every street of a developing nation. the advantages lie in its easy and valuable functioning. This will not only improve the streets we live in, but also provide a pavement for better working system. **Advantages of this system:** -

- Efficient and effective Functioning.
- Cleaner Environs
- Better health issues.
- Pollution free and stinking free environs
- Smart cities
- Technology development
- Tourist attraction.

Once implemented, this method would be easy to work on. The garbage will be dumped into the bins thereby reducing the health-threats imposed by the trash present all-around.

### 3.4 FUTURE WORKS

The moisture sensor can be implemented hand in hand with the other sensors and the compartments for segregating the dry and wet waste can be created which will solve the issues related to waste segregation.

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## 4. CONCLUSION

Improper disposal and improper maintenance of domestic waste create issues in public health and environment pollution thus this paper attempts to provide practical solution towards managing the waste collaborating it with the use of IOT i.e., providing free internet facilities for a specific time once

the trash is dumped into the bin. the proposed system will definitely help to overcome all the serious issues related to waste and keep the environment clean. This model continuously monitors the level of waste in the biodegradable and non-biodegradable compartment of the dustbin. The main aim of this project is to maintain the hygienic and dirt-free environment in the city which in turn creates an environment for better living. By implementing this project in real time basis, it assures the improved database for garbage collection time and waste management amount at each location. It also improves the cleaning of the garbage bins until it reaches its maximum. The proposed model for waste management system for the green society is implement at two levels one is for every house of the society and level two works at the societal level.

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