

# IoT Based Solid Waste Management System using Arduino Mega.



Aarti Sudam Satkar, Mohini P. Sardey

**Abstract:** Solid waste management is one of the major concerns now a day and they are very harmful to environment. The Municipal Corporation places the common dustbin at various places in the city which are flooded with waste, which leads to unhygienic conditions in the areas which they are place and causes discomfort to the Citizens. We here propose an IoT Based system to overcome this problem. The Propose system consists of Arduino Controller, few garbage loaded sensors, gases sensor and they are continuously monitored through web page This sensors will be embedded throughout the dustbin to check the level of the dustbin, the device will monitor the real time data and continuously show real time value on LCD display.

**Keywords:** IoT, Waste Management, Arduino Mega, Weight Sensor, Gas Sensor, Ultrasonic Sensor, LCD, RFID, GSM.

## I. INTRODUCTION

Solid waste management it is becoming necessary and challenging to manage with rapid urbanization and increased population growth. In these we are talking about waste collection and management system and they can be highly focuses to the common dustbin placed by Municipal Corporation in various different areas in each city.

The Municipal Corporation placed dustbin improper way and people also not used these dustbin properly and garbage also throw outside the dustbin therefore we can phases many health issue and unhygienic problem we are facing environmental pollution also reduces like, Air pollution harmful disease etc

The key to efficient waste management is to ensure proper segregation of waste at source and to ensure that the waste goes through different streams of recycling and restores recovery improper management system which not contains real time status of dustbin fullness.

In these we proposed IOT internet of things based solid waste management system using auduino mega which allows waste management authorities and continuously monitor the status of dustbin placed at different location.

We can give the RFID card to the authorized person and we can set a particular level of dustbin and also added the gas

sensor to detect the gas present in the dustbin. When dustbin full to its level then it will automatically locked and message will send via GSM via Municipal Corporation and open when authorized person will come

## II. LITERATURE REVIEW

Many works has been carried in solid waste management systems.

In 2016, Abhishek Dev, Maneesh Jasrotia, Muzammil Nadaf, Rushabha Shaha, they implemented a system to Smart Garbage Collection System and they also using IOT technology in Which they can check the status level of Garbage to reach its maximum. And they can also cleaning the dustbin in a proper way [1].

In 2018, Jia-Wei Lu, Ni-Bin Chang, Feng Zhu, Jing Hai, and Li Liao proposed architecture of each level of developed solid green system. In which they also added a current technologies and methods. They proposed solid green system and establish the relationship between waste separation and other collections [2].

In 2017, Krishna Nirde, Prashant S. Mulay, Uttam M. Chaskar proposed an IOT based solid waste collection and management system for smart cities. They also integrate the sensing system and using the ultrasonic sensor and load cell for the purpose of automatic status of dustbin monitoring system [3].

In 2015, Jia-Wei, Ni-Bin Chang, Li Liao, Meng-Ying Liao they proposed a separate garbage collection of out form and co-collection with the real life instance happen in muliconstraints they also developed smart and green urban waste collection system [4].

In 2017, Trushali S. Vasagade, Shabanam S. Tamboli, Archana D. Shinde proposed a system in which best suitable concept they implemented and also provides solution for the biggest issues for managing the solid waste in a proper way and collecting and cleaning the waste thrown to outside the dustbin. They use GSM because they provide a bin fullness status to the Municipal Corporation [5].

In 2015, Priyanka Shrivastava, Shivangi Mishra, S.K. Katiyar they proposed various GIS models and these models are used in solid waste management. These models are innovative purpose and planning to the solid waste [6].

In 2016, Theodoros Anagnostopoulos, Arkady Zaslavsky, Kostas Kolomvatsos, Alexey Medvedev, Pouria Amirian, Jeremy Morley, Stathes Hadjieftymiades they focuses on various types of application adding in waste management.

Manuscript published on 30 September 2019

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They also focus to achieve a large set of models to deal with the waste management. They present the effort of smart and good transportation with include the IOT for smart cities and waste collection [7].

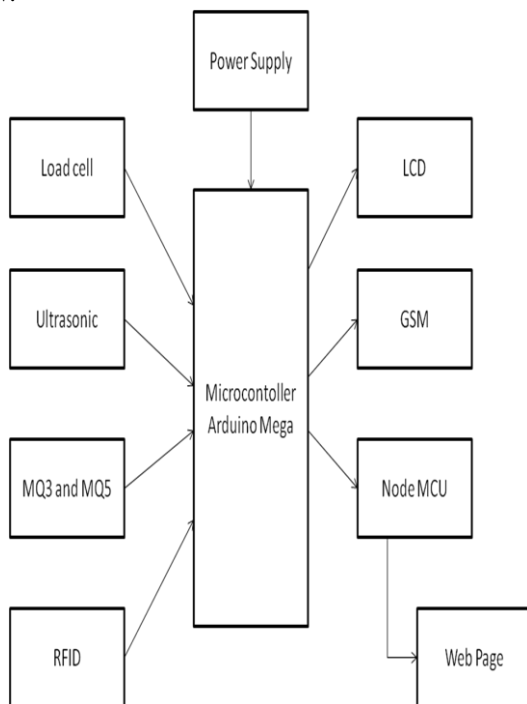
In 2019, Dr.Raksha Elhassan, Dr.Mahmoud Ali Ahmed, Mrs.Randa AbdAllalem they proposed many advantages than the other of the systems used before the concept of recycling of the waste advantage of recycling will improve the better human life and also improve the growth [8].

From the above literature review, we have included the idea of solid waste management. In these system we can added a gas sensors and these sensor will detect the gas are present in dustbin we can also set a particular level of dustbin using ultrasonic sensor. When the dustbin is reached its level then it will automatically locked and message goes via GSM via Municipal Corporation dustbin will open when authorized person will collect these garbage. (Here we can give RFID card to the authorized person and they can swipe a card then dustbin will open)

**III. SYSTEM DESIGN**

The solid waste management system consists of several sensors to detect the real time monitoring system and these sensors are interface with the micro controller.

The block diagram of the proposed system is as shown below.

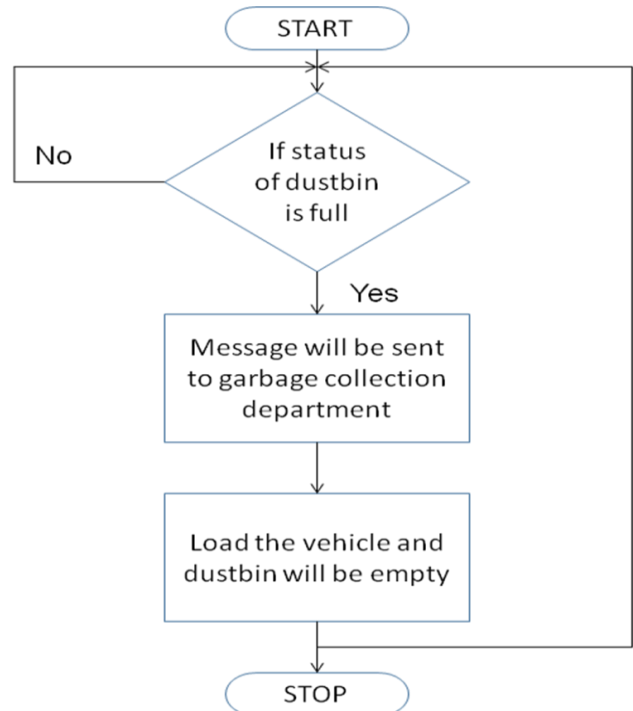


**Fig 1. Block Diagram of Proposed**

Fig 1 Shows the proposed system in which two ultrasonic sensor are placed at the top of the dustbin to avoid the inaccurate level of the dustbin and interface to the microcontroller weight sensor placed at the bottom of the dustbin and it sense the weight of the garbage filled in the dustbin these ultrasonic sensor and weight sensor send the signal to the microcontroller. Arduino mega give the information received through collector and transferred to the web page.

Ultrasonic sensor represents level status of the dustbin to

check if it's full or empty. Load cell sense the weight of garbage in the dustbin and also confirms if max limit is reached or not.



**Fig 2 Flow chart**

Dustbin get filled to maximum level, ten indications goes to the LCD display.

Monitoring the webpage is very useful to the Garbage collection department as it tracks the location. The function of GSM module is used to send message to garbage collection department.

RFID is used in this system to unlock the dustbin by authorize person. In this system we have used two gas sensors MQ3 & MQ5 to detect the gases present in the dustbin.

**IV. HARDWARE DESCRIPTION**

**A. Ultrasonic Sensor: HC- SR04**

The use of ultrasonic sensor has the sensing rage of 2.5cm to 400cm. In our system we will mount the sensor at the highest point of the dustbin, by using this sensor we can give accurate level of dustbin

**B. Gas Detector:**

In the proposed system MQ3 and MQ5 gas sensors are used. MQ3: It's an alcohol sensor which is use to detect alcohol in the garbage.

MQ5: A gas sensor which detects the presence of gases like hydrogen, carbon monoxide, methane and LPG.

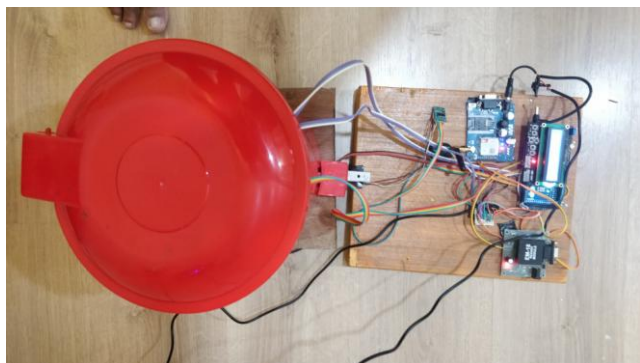
**V. SOFTWARE DESCRIPTION**

Arduino mega 2560 is a microcontroller based on the AT mega 2560. It has 54 digital input/output pins( in which 14 can be used as PWM output, 16 analog inputs, 4 UART, hardware serial port) , a 16 MHz crystal oscillator , a USB connection, a power jack, & a reset.

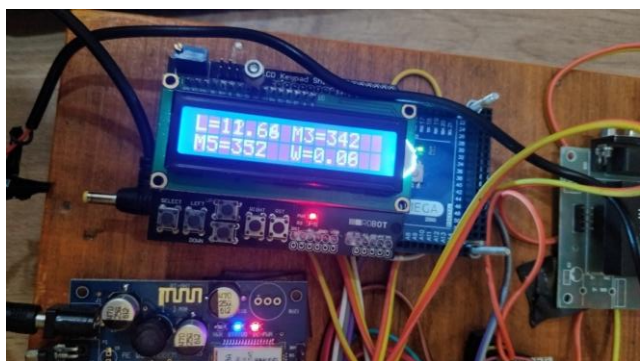


**VI. RESULT**

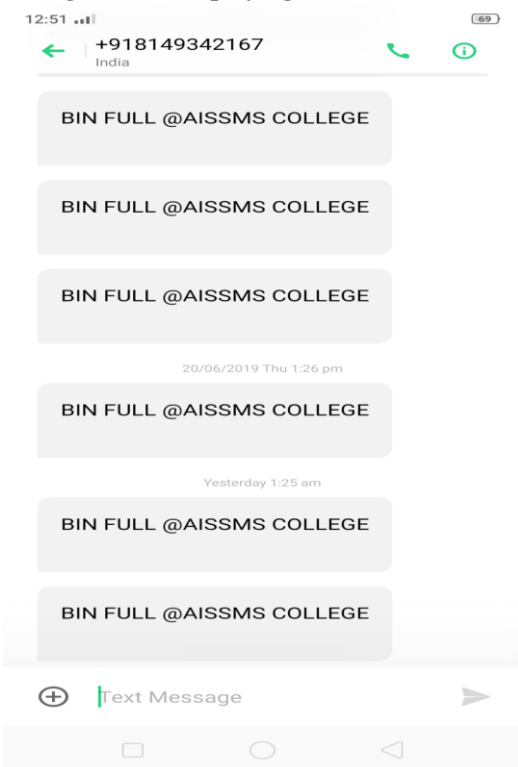
The proposed system is tested and the result is as shown below.



**Fig 3. Experimental setup**



**Fig 4. LCD Displaying the sensed value**



**Fig 5. Text Message received thorough GSM**

In Fig 3. The experimental set up is shown, in these all the hardware components are connected through the Arduino Mega. The proposed system is tested and output shown in LCD display in above Fig.4 these values shows the accurate levels of dustbin. They can continuously monitor real time value of dustbin and also monitor the gases value present in the garbage. When the dustbin is full then message will send

via GSM through Municipal Corporation. Here we can select area i.e. AISSMS College. When bin is full of that area then as shown in Fig.5 these type of message goes to municipal corporation .we also proposed the system in which we give RFID card to the authorized person.

**VII. CONCLUSION**

This paper represents the hardware implementation of the real time monitoring of IOT based waste management system using Arduino Mega. We have focused on the design and the implementation of monitoring system to continuously monitor the level status of the dustbin and also monitor the gases. the sensors are places at the top of the dustbin(ultrasonic sensor) and bottom of the dustbin(weight sensor).by using these sensors we can give the accurate level of dustbin and weight sensor also sense weight of the garbage present in the dustbin. these paper also overcome the unnecessarily garbage in the dustbin.becase when dustbin full to its level then it will automatically locked and it will open when authorized person came and collect these bin by swapping the RFID card. Using this system we can reduce unwanted garbage and also our environmental condition clean.

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