



# Smart Garbage Management System Using IOT-A Survey

Mr.VelumadhavaRao.R<sup>1</sup>,Ranjini.K<sup>2</sup>, Sangeetha.J<sup>3</sup>, Sangeetha.S<sup>4</sup>

<sup>1</sup>Assistant Professor, <sup>2,3,4</sup>UG Scholars,Department of Computer Science & Engineering, Rajalakshmi Institute of Technology ,Chennai, India.  
[velumadhavarao.r@ritchennai.edu.in](mailto:velumadhavarao.r@ritchennai.edu.in)<sup>1</sup>[ranjinikarthi96@gmail.com](mailto:ranjinikarthi96@gmail.com)<sup>2</sup>[sangeethajj20@gmail.com](mailto:sangeethajj20@gmail.com)<sup>3</sup>[sangeemangee2010@gmail.com](mailto:sangeemangee2010@gmail.com)<sup>4</sup>

**Abstract:** Waste management is one of the major problems faced by our country. The key issue in the waste management is that the garbage bin at public places gets overflowed before the cleaning process starts which in turn leads to various hazards such as bad odor and dissemination of various diseases. There are many models that are developed to solve the issues using various technologies such as RFID,GSM/GPRS, cloud. All these models include a smart garbage alert system for a proper garbage management by giving an alert signal.The alert message indicating the location of the bin is sent to the municipal web server for instant cleaning of dustbin based on level of garbage filling. The sensor which is interfaced with the microcontroller is employed to check the garbage level filled in the dustbin.Then the readings are processed using microcontroller.The location of the garbage bin is tracked using GSM module when the garbage level is reached based on the readings.Once the dustbin is emptied, the status is sent to the database which is stored in the cloud.This paper presents a comparative analysis on smart garbage management system

**Keywords:** Microcontroller, RFID, GSM/GPRS

## I.INTRODUCTION

Waste management is the collection, transport, processing or disposal, managing and monitoring of waste materials. If the management and disposal is not done properly, it can cause serious impacts on health and the problems to the surrounding environment. In our day to day life, we see scenarios of garbage bins being overfull and all the garbage spills out which causes pollution. Not taking proper action on this results in multiplication of number of diseases as huge number of insects and mosquitoes breeding on it.A big Challenge in the urban cities is proper Solid waste management not only in India but also for most of the other countries across globe.InIoT, Sensors are used in almost all parts and these sensors are helpful in converting raw physical data into digital signals which can be transmitted to its control centre. With this technology, we can monitor changes in the environment remotely from any part of the world through internet. Smart garbage bin works in the similar principle with the ultrasonic sensor indicating its depth and level of garbage in the bin. The ultrasonic sensor readings intimates us the various levels of garbage in the

garbage bins and to send its output when the predefined threshold level is reached. These readings details are further sent to the Arduino.The main problem of the existing solid waste collection and management system is that municipal office are unaware of status on level of bin in the city. This design designates a technique in which the garbage level could be checked at regular intervals which would prevent the undesirable overflow of the bin. In addition to this it also has facilitation that intimate the authority to clean up in case of any overflows. The filling level of the garbage in the dustbin and its original level height could be sensed by the sensor. Programming in the microcontroller is made in such a way that once particular level in the garbage bin is reached, an alert sent to the municipality requesting a clean-up.A tag, also known as transponder, is made of a semiconductor chip, an antenna, and a battery. The main function of an RFID tag is to store data and transmit it to the interrogator. It consists of an electronic chip and an antenna encapsulated in a package to form a usable tag, such as a packing label that might be attached to a box.The chip contains memory where data can be stored. One can read that written data. General packet



radio service (GPRS) is a wireless data service on global system for mobile communications (GSM) protocol. GPRS was proposed by European Telecommunications Standards Institute (ETSI) in response to the earlier i-mode packet-switched cellular technologies. An Ultrasonic sensor is a device which can measure the distance to an object using sound waves. It works by sending out a sound wave at a certain frequency and listening for that wave to bounce back. ZigBee technology is used in [13] wherein if the garbage level status is full then corresponding message is sent to higher authority ,in [4] ZigBee and global system for mobile communication (GSM) is used. The sensors are also used to detect the garbage level and in [14]

## II.LITERATURE REVIEW

### A.ULTRASONIC SENSOR BASED

Ultrasonic sensors are devices that send and receive ultrasonic waves commonly used on many types of sensing. These devices include proximity counting, level measurement, and security applications.

For this , an ultrasonic sensor 2 (part number 255-400ET18-RO) is used.

- Center frequency: 40.0 kHz  $\pm$  1 kHz
- SPL 115 dB
- Bandwidth: 1.5 kHz (-6 dB)
- Input voltage: 20 V max

The ultrasonic distance measurer (UDM) is implemented with an MC9RS08KA2, a transmitter, receiver and an array of three operational amplifiers. These are used to amplify the wave signal and square it.The system also has a background debug mode (BDM) connector. It is used for programming and

debugging the MCU and the firmware code.Because the MCU does not have an implemented Serial Communication Interface (SCI) module, an emulated SCI uses the port A pin 4 (PTA4) to output the distance value.

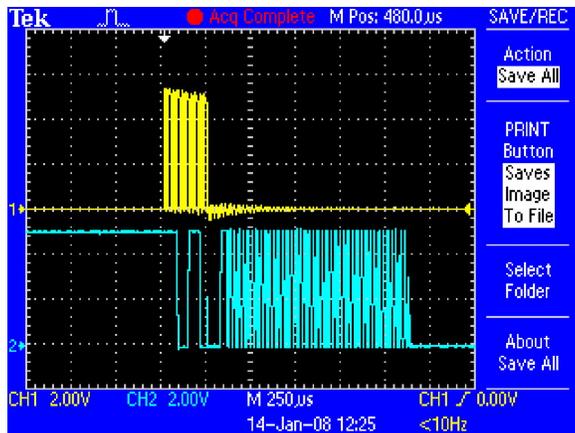


The functions required to implement this UDM are:

- Time base of 1 millisecond
- 40 kHz 10 cycle burst is generated every 100 milliseconds.
- The MTIM is configured at 80 kHz to generate a signal at 40 kHz (80 kHz / 2).
- Filter of the reflected signal (echo signal)
- Measure the time (distance) between the burst Tx and the echo signal
- Conversion of time into distance
- Send the distance through an emulated SCI9

The system also has a background debug mode (BDM) connector. It is used for programming and debugging the MCU and the firmware code.

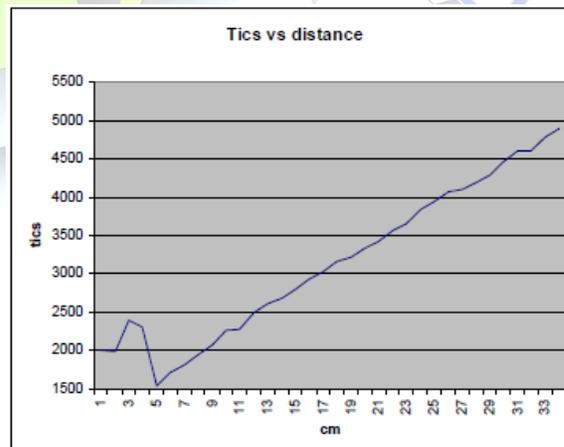
Because the MCU does not have an implemented Serial Communication Interface (SCI) module, an emulated SCI uses the port A pin 4 (PTA4) to output the distance value.The ultrasonic sensors are used in [1] and [12]. The models proposed in [7] and [13] uses IR sensors for identifying the level of garbage filled.



The proposed models of [5] and [9] uses RFID. A rectangular passive RFID tag is shown in the above image. The passive tags are available in different shapes and sizes. To recognize the identity of an **RFID tag**, RFID reader sends radio signals which is captured by the coil (working as antenna) for the tag. The coil receives these signals as alternating current and passes to the chip. The chip extracts both the power and the information from this alternating current. By communicating with the non volatile memory of the chip that stores unique id as well as other information, it sends back the required signal to the antenna which is then transmitted to the RFID reader.

## B. RFID BASED DEVICES

**RFID tag** is a small device which stores and sends data to RFID reader. They are categorized in two types – **active tag and passive tag**. Active tags are those which contain an internal battery and do not require power from the reader. Typically active tags have a longer distance range than passive tags. Passive tags are smaller and lighter in size than the active tags. They do not contain an internal battery and thus depend on RFID reader for operating power and certainly have a low range limited up to few meters.





### C.GSM/GPRS MODULE

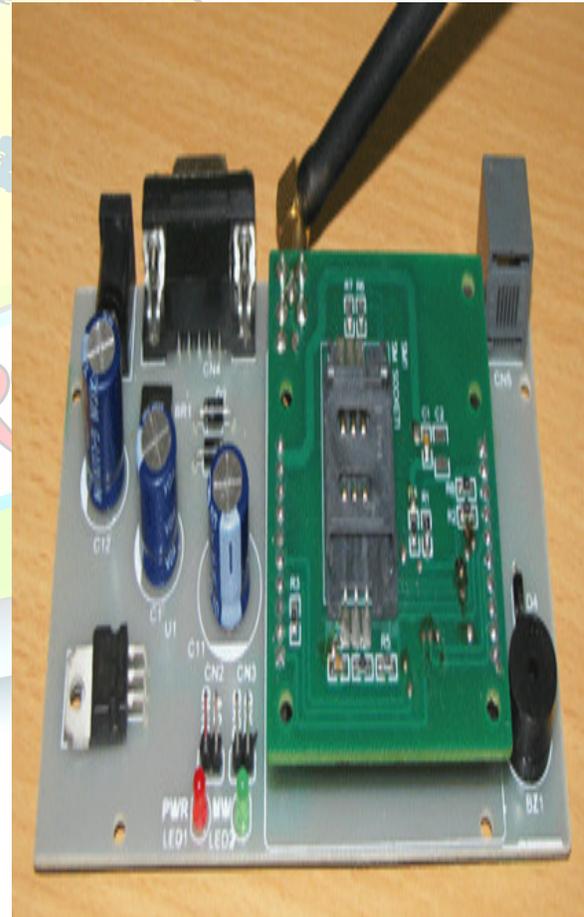
GSM/GPRS modules are utilized to convey between a PC and a GSM/GPRS framework. GSM/GPRS modules used to build up correspondence between a PC and a GSM-GPRS framework. Worldwide Framework for Portable correspondence (GSM) is an engineering utilized for versatile correspondence in the vast majority of the nations. Worldwide Bundle Radio Administration (GPRS) is an expansion of GSM that empowers higher information transmission rate. GSM/GPRS module comprises of a GSM/GPRS modem gathered together with control supply circuit and correspondence interfaces (like RS-232, USB, and so forth) for computer .Mobile Termination is interfaced with the GSM versatile system and is controlled by a baseband processor. It handles access to SIM, discourse encoding and deciphering, flagging and other system related undertakings. The Terminal Gear is an application processor that arrangements with taking care of tasks identified with keypad, screen, telephone memory and other equipment and programming administrations inserted into the handset. The Terminal Connector builds up correspondence between the Terminal Hardware and the Versatile End utilizing AT charges. The correspondence with the system in a GSM/GPRS versatile is done by the baseband processor.A GSM portable is a total framework in itself with implanted processors that are committed to give an interface between the client and the versatile system. The AT orders are served between the processors of the versatile end and the terminal gear which is utilized in [3] and [15]. The portable handset can likewise be outfitted with a USB interface to associate with a PC, yet it might possibly bolster AT summons from the PC or an outer processor/controller. The GSM/GPRS module, then again, dependably needs a PC or outside processor/controller to get AT charges from. GSM/GPRS module itself does not give any interface between the client and the system, however the PC to which module is associated is the interface amongst client and system.

Favorable position that GSM/GPRS modules offer is that they bolster connected SMS which may not be upheld in some GSM portable handsets. Additionally some versatile handsets can't get MMS when associated with a computer.GSM/GPRS MODEM is a class of remote MODEM gadgets that are intended for correspondence of a PC with the GSM and GPRS organize. It requires a SIM (Endorser Personality Module) card simply like cell phones to enact correspondence with the system. Likewise they have IMEI (Global Portable Hardware Character) number

like cell phones for their recognizable proof. A GSM/GPRS MODEM can play out the accompanying activities:

- Get, send or erase SMS messages in a SIM.
- Read, include, seek phonebook sections of the SIM.
- Make, Get, or dismiss a voice call.

The MODEM needs AT charges, for interacting with processor or controller, which are conveyed through serial correspondence. These charges are sent by the controller/processor. The MODEM sends back an outcome after it gets a command. Distinctive AT orders upheld by the MODEM can be sent by the processor/controller/PC to associate with the GSM and GPRS cell organize.





### III.CONCLUSION

An embedded based intelligent alert system is introduced for the efficient monitoring and maintenance of the garbage in the garbage bins. This system helps in the regular and proper cleaning of the garbage bins by sending alerts to the workers and call for the cleaning process at regular intervals. It also enhances the system by further inscribing the cleaning status in real time which would measure the performance of the workers of the team. Thus this system comes as an efficient and a necessary solution in maintaining the environment. In addition to this it also aids to reduce the necessity of high human intervention in garbage maintenance of the municipality corporations and pollution monitoring systems.

### REFERENCES

- [1] Asifa Indi, Nikitha Sukrithalal, Gayatri Babu, Jayshree Jha "Smart System for Garbage Management"
- [2] Belal Chowdhury Morshed U. Chowdhury "RFID-based Real-time Smart Waste Management System" 2007 Australasian Telecommunication Networks and Applications Conference December 2nd – 5th 2007, Christchurch, New Zealand.
- [3] Gaikwad Prajakta, Jadhav Kalyani, Machale Snehal "SMART GARBAGE COLLECTION SYSTEM IN RESIDENTIAL AREA" IJRET: International Journal of Research in Engineering and Technology Volume: 04 Issue: 03 | Mar-2015
- [4] Kanchan Mahajan, Prof. J. S. Chitode "Waste Bin Monitoring System Using Integrated Technologies" International Journal of Innovative Research in Science, Engineering and Technology Vol. 3, Issue 7, July 2014
- [5] Md. Liakot Ali, Mahbul Alam and Md. Abu Nayeem Redwanur Rahaman "RFID Based E-monitoring System for Municipal Solid Waste Management" 2012 7th International Conference on Electrical and Computer Engineering 20-22 December, 2012, Dhaka, Bangladesh
- [6] Narayan Sharma, Nirman Singha, Tanmoy Dutta "Smart Bin Implementation for Smart Cities" International Journal of Scientific & Engineering

Year	Title of the paper	Author	Components Used	Advantage	Limitations
2007	RFID-based real-time Waste management system	Belal Chowdhury, Belal Chowdhury	Rfid, SQL server, WIFI module	Barcode, registration number is induced to keep garbage clean	RFID Waste Tag must be passive, semi passive and active
2012	RFID Based E-monitoring System for Municipal Solid Waste Management	Md. Liakot Ali, Mahbul Alam and Md. Abu Nayeem Redwanur Rahaman	GPRS sensors, RFID, microcontroller PIC16F876A, lcd display	It is a micro-controller based embedded system so it is portable and low cost.	Data management is inefficient since cloud storage is not used.
2014	Waste Bin Monitoring System Using Integrated Technologies	Kanchan Mahajan, Prof. J. S. Chitode	Zigbee, ARM, GSM.	Real time interface can be done	Arm used here is costly
2014	E-Tracking System For Municipal Solid Waste Management Using Rfid Technology	Dr. S. Padmapriya and R. Siva Kumar	A Microchip PIC16F887A, RFID, GSM/GPRS, Infrared sensor	Implementation is simple	Infrared sensor is costly when compared to ultrasonic sensor.
2015	Smart Bin Implementation for Smart Cities	Narayana Sharma, Nirman Singha, Tanmoy Dutta	Machine Learning, Real time analytics	Average time for smart bin to get filled up is computed	Must have knowledge of machine learning



Research, Volume 6, Issue 9, September-2015 ISSN 2229-5518

[7]S.S.Navghane, M.S.Killedar, Dr.V.M.Rohokale” IoT Based Smart Garbage and Waste Collection Bin “ International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 5, Issue 5, May 2016

[8]Neetha, Sanjana Sharma, VaishnaviV,VandanaBedhi “Smart Bin- An “Internet of Things” Approach to Clean and safe Public Space” International conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) ( I-SMAC 2017)

[9] Dr. S. Padmapriya M.E., PhD R. Siva Kumar M.Tech “E-TRACKING SYSETEM FOR MUNICIPAL SOLID WASTE MANAGEMENT USING RFID TECHNOLOGY“ International Journal of Advanced Research in

Electronics, Communication & Instrumentation Engineering and Development

Volume: 1 Issue: 2 08-Feb-2014,ISSN\_NO: 2347 -7210

[10] C. Poongodi, M.Kowsalya, S.NaveenKumar, H.Kavibharathi “SMART GARBAGE BIN” International Journal of Scientific & Engineering Research Volume 8, Issue 5, May-2017 ISSN 2229-5518

[11]SagnikKanta ,SrinjoyJash , HimadriNathSaha “Internet Of Things Based Garbage Monitoring System “ 978-1-5386-2215-5/17/\$31.00 ©2017 IEEE

[12]Sanket S. Ghate,Sangeeta V. Kurundkar “SWACHH: An Effective Real Time Solid Waste Management System for Municipality” International Journal of Computer Applications (0975 – 8887) Volume 149 – No.4, September 2016

[13]Shambala S Salunkhe, Madhuri D Yadav,Vrushali V Kulkarni “IOT Based Waste Monitoring For Smart City” International Journal Of Engineering And Computer Science ISSN:2319-7242 Volume 6 Issue 4 April 2017, Page No. 21015-21017.

[14]Tarandeep Singh, Rita Mahajan, Deepak Bagai “International Journal of Innovative Research in Computer and Communication Engineering” Vol. 4, Issue 6, June 2016

[15] S. Vinoth Kumar, T. SenthilKumaran, A. Krishna Kumar and MahanteshMathapati “Smart Garbage Monitoring and Clearance System using Internet of Things “2017 IEEE International Conference on Smart Technologies and Management for Computing, Communication, Controls, Energy and Materials (ICSTM), VeltechDr.RR& Dr.SR University, Chennai, T.N., India. 2 - 4 August 2017. pp.184-189.

