

# Smart Waste Management Using IoT

Sakshi Neema<sup>1</sup>, Prof. Kaushal Gor<sup>2</sup>

<sup>1</sup>PG Student, MCA, Parul Institute of Engineering and Technology-MCA, Parul University, Vadodara, Gujarat, India

<sup>2</sup>Assistant Professor, MCA, Parul Institute of Engineering and Technology-MCA, Parul University, Vadodara, Gujarat, India

## ABSTRACT

The rapid increase in population, demands higher infrastructure and a Lots of facilities. And nowadays the waste management is the considerable challenge to the authorities, not only for the developing nations but also for the developed once. The waste creates unhygienic condition for the citizens which are cause of disease. To solve this problem the proposed technique is IOT based "smart waste management" is best and trending solution. The garbage bins are developed by using sensors and some networks. Garbage bin checks the fill level of dustbin using sensors and automatically a Truck driver (garbage collector) gets a information by GPS that the particular area or locality the dustbins are filled. The entire process is controlled by a At mega 328P 8-bits microcontroller. It is design using IOT that can give a framework to a smart waste management system.

**Keywords :** Internet-of-Things, Smart waste management (SWM), Sensors.

## Article Info

Volume 9, Issue 6

Page Number : 16-21

## Publication Issue :

November-December-2022

## Article History

Accepted : 01 Nov 2022

Published: 05 Nov 2022

## I. INTRODUCTION

It has been said and believed since that "cleanliness is next to godliness". In this age of environmental problem people are curious about maintaining cleanliness their surroundings for their good health. Weather it is small four member's family or everyone in the area gives equal importance to cleanliness for maintaining public health and hygiene. The amount of waste produced everyday by the industries and household are increasing a major issue of waste, and the reason behind this is the use of package items, papers, foods, plastics, metals, glass etc. with population growth and changes in their life style, waste management has become a challenge not only

for developing countries but also for developed ones. By 2050 more than 84% population of developed countries and more than 64% in developing countries will move to urban areas. This type of situation usually happened when garbage collector has no information about bins condition i.e. bins are filled or not and in which area bins are overflow.

Waste management is a costly operation and it takes large4 number of resources and labor. Lots of Efforts had been taken by the government to improve waste management systems. government launching the 3Rs campaign (recycle, reuse and reduce).we introduce smart waste management technique to resolve this problem. It reduces cost as well as takes less time. For

better health and hygiene in India under the guidance of “Government” Prime Minister Mr.Narendra Modi launched a clean India from which we come up with the concepts of “Smart Cities”. Waste management is basically defines as a collection of waste, transport, recovery, and disposal of waste, or monitoring and regulation of waste process.



Fig 1: Unaddressed Dustbin



Fig 2: Overflow Dustbin

Smart waste management is a technique used to collect waste from each area on time. The project deals with all problems related to waste management in smart cities, where the garbage collection system is non-optimized.

This system allows the user to know the fill level of each garbage bins in the city at all time, to give a cost-effective and time-saving route to the truck drivers. The Internet of Things (IoT) is a new technology which has the potential to globally change the human's

life in a positive way. IoT changed the traditional way of living into a high tech life style. Smart cities, smart home, pollution control, energy saving are such transformation due to IoT.

The new concepts of waste follow 7 R's – Rethink, Reuse, Recycle, Reduce, Regular, Refuse and Research.

## II. LITRATURE REVIEW

Survey from some different documents to get information about existing works. In paper [1] introduce the iot based waste management for smart cities to overcome the challenges in the environment. Due to overflowing of the dustbin causes unhygienic condition and create health issues, the dustbin are placed in the entire city, it is delivered with minimum cost and tracking the garbage, and the Blynk app is used to get the immediate SMS as soon as garbage bin reaches its full level.

They proposed a system to ensure garbage collection when the garbage level on paper [2] reaches a maximum value. The system has master and vassal configuration and includes real-time monitoring of garbage with wireless communication. The system also provides accurate reports that increase the efficiency of the system.

In paper[3] introduce the Architecture for garbage monitoring systems using integrated technology, proposed the novel architecture of waste management that utilizes the concept of IoT and digital image processing, the architecture acts as a observation system to monitor the overflow of the garbage and delivers the message to the concerned authorities to take the necessary and instant action.

In paper [4] they proposed a system based on the three-element master station, the slave station, and the iot platform. The master station collects data from the slave and transmits it to the iot application for remote management and monitoring purposes. The system is

powered by a solar panel. They used four parameters such as temperature value, percentage reading level, smoke detection and GPS location. The limitation of this system is that it does not develop reports for better system and maintenance.

They introduce smart garbage management system on paper [5] using IR sensor, microcontroller and Wi-Fi module. This system assured the cleaning of dustbins in a short time when the garbage level reached its peak level. If the dustbin was not cleaned in specific time, then the records were sent to the higher authorities who took appropriate action against the garbage collector. This system also helped to monitor the fake reports and helped to reduce the corruption. It ultimately helped to keep cleanliness in the society and Homes.

In paper [6] they proposed a cloud-based waste management system in which bins are equipped with sensors that report the level of waste and upload information containing information to the cloud. It also provides better way to collect waste. The limitation of this system is that it sends a message only to the garbage collector not to the authorities or municipal office.

On paper [7] In this system the information of all smart garbage dustbins can be accessed from anywhere and anytime by the authorities and they can take a decision according to area where they find near. By implementing this proposed system, the cost reduction and resource optimization, effective usage of smart dustbins was carried out. This system reduced traffic in the city. In major cities the garbage collection vehicle visited the areas twice or thrice in a day depending on the population of the particular area. The System informed the status of each and every garbage bin in real time so that the concerned authority can send the garbage collection vehicle on particular area where dustbin is full.

In paper [8] they proposed a smart trash can in which various sensors are used to detect the weight and height of the trash in the dustbin. The sensor detects abnormal behavior. Such as a smoke sensor. The sensor sends a message to the cloud server when the bin weighs more than capacity. A warning system is also implemented in case of any abnormal behavior in the bin. All sensors connect to Wifi near the bin and take data and message pass to the server.

In paper [9] they used an ultrasonic sensor to know the amount of garbage collected in containers the data is sent through GSM module to an authorized phone number moisture sensor is used to sense the wet waste when it reaches to the threshold value it sends the SMS even if it is not filled the limitation of this system is that it sends message only to the authorized number and it only show the location not the optimize route. The limitation of this system is that it sends the message only to the authorized number and only shows the location which is not the optimized way.

In paper [10] they place the bin on the conveyor belt and take inputs from the system switches and then send the signal to the microcontroller unit using RF technology. An Android application has been developed for relative monitoring. The limitation of this system is that it applies to apartment type bidding.

### III. TOOLS & TECHNOLOGY

*Ultrasonic Sensor* - Ultrasonic sensor will be used to detect the level of garbage filled in the garbage bin. The level of garbage will be representing in terms of distance between the sensor and garbage present in dustbin. This sensor has 4pins- VCC (5V), Trig, Echo and GND. Trig pin is used to send out the ultrasonic sound pulse and Echo pin produces a pulse when reflected signal is received. Sensor will calculate the time interval between sending the signal and receiving the echo for determining the distance. 40KHz is a Working frequency of ultrasonic sensor.



Fig 3: Ultrasonic sensor

*Infrared and Moisture Sensor* - IR sensor is an electronic device that emits the light when some objects are thrown to the surroundings. An infrared sensor can measure the heat of an object as well as detects the motion. An infrared sensor is used to detect debris around the bin. when object is thrown near the bin, it is detected by an infrared sensor and it turns on the buzzer.

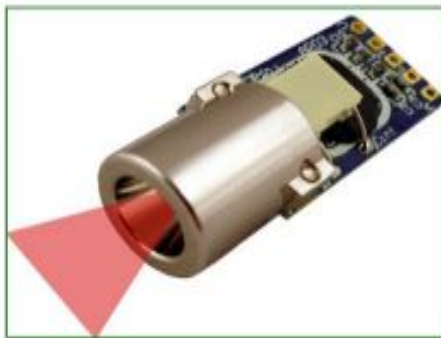


Fig 4: Infrared Sensor



Fig 5: Moisture Sensor

*Raspberry pi3 Sensor* - raspberry pi3 is a microcontroller which has built in wifi module. Raspberry pi3 is used to collect information from sensor and send it to server using wifi.



Fig 6: Raspberry-pi3 Sensor

#### IV. PROPOSED WORK

We proposed a smart waste management system on the basics of level of waste present in the dustbin. this system offers a real time monitoring of bin status data from two sensing systems: first one is waste filled level sensing which sense the level of waste, and second one is weight sensing which sense the weight of the waste. Each and every bin has a sensor which will sense the dustbin is full or not i.e. the level of waste present in the bin.

The hardware component we used to fixed in the bin are ultrasonic sensor which is used to check the level of the waste present in the bin. the weight sensor which is used to check the weight of the wet waste present in the bins. Most of the times even if the dustbin is not filled it start stinking which may result to pungent smell in the locality to prevent this situation we used moisture sensor fixed in the dustbin. it sense the moisture content present in the waste bin, if the moisture content is more than a particle of dry waste level, the information is sent to the waste management center. We also attached infrared sensor to the bin to detect debris around the bin when some objects are thrown around the bin the infrared sensor

detect and turns on the buzzer. The Weight sensor helps to guide a garbage collector how much quantity of waste is present in the dustbin. And infrared sensor guides or aware peoples using the buzzer not through the waste outside the dustbin. Moisture sensor sense the present wet waste. The microcontroller we used is Raspberry-pi3, which has built-in WiFi module. Raspberry-pi3 is used for collecting a information and sent it to the server. Raspberry-pi3 sends information using wifi with dustbin ID which helps to find a location or area of dustbin.

Real time analysis should be done to generate various reports related waste.

The waste management authorities knows what kind of waste is coming and the what quantity of waste is coming so it will be easier to recycle the waste. The one-third food which is wastage daily from houses and the waste food is result of greenhouse gas emission are the cause of most health issue.

## V. CONCLUSION

There is lots of work are going on to take care of waste bins. Therefore, by implementing these smart bins, the bins will be user-friendly, and it will be easier to maintain clean and hygienic environment around the bin. This will prevent overflowing of bin problem. This will also help in real time monitoring to the municipal corporation and prevent dustbin to overflow. This system helps for both dry and wet waste with the help of moisture sensor. This system helps to generates reports which area generates most waste. It will help to maintain clean and hygienic environment and maintain cleanliness.

## VI. REFERENCES

- [1]. Shyam, G.K., Manvi, S.S., Bharti, P.: Smart waste management using Internet-of-Things (IoT). In: 2017 2nd International Conference on Computing and Communications Technologies (ICCCCT), Chennai, pp. 199–203 (2017)
- [2]. Bharadwaj, A.S., Rego, R., Chowdhury, A.: IoT based solid waste management system: a conceptual approach with an architectural solution as a smart city application. In: 2016 IEEE Annual India Conference (INDICON), Bangalore, pp. 1–6 (2016)
- [3]. Wijaya, A.S., Zainuddin, Z., Niswar, M.: Design a smart waste bin for smart waste management. In: 2017 5th International Conference on Instrumentation, Control, and Automation (ICA), Yogyakarta, pp. 62–66 (2017)
- [4]. Cloud-based Smart Waste Management for Smart Cities Mohammad Aazam, Marc St-Hillarie, Chung-Horng Lung, Ioannis Lambadaris 2016 IEEE 21st International Workshop on Computer Aided Modeling and Design of Communication Links and Networks (CAMAD)
- [5]. Automation of smart waste management using iot to support “swachh bharat abhiyan” – a practical approach 1 Bharadwaj B, 2 M Kumudha, 3 Gowri Chandra N, 4 Chaithra G, 2017 2nd International conference on computing and communications technology
- [6]. Smart Waste Management System using IoT Prof. S.A. Mahajan, Akshay Kokane, Apoorva Shewale, Mrunaya Shinde, Shivani Ingale, [Vol-4, Issue-4, Apr- 2017] ISSN: 2349-6495(P) | 2456-1908(O)
- [7]. Smart Waste Management using Internet-of-Things (IoT) Gopal Kirshna Shyam1, Sunilkumar S. Manvi2, Priyanka Bharti3 2017 2nd International conference on computing and communications technologies (ICCCCT)
- [8]. IoT based solid waste management system for smart city Krishna Nirde 1, Prashant S. Mulay 2, Uttam M.Chaskar 3 International Conference on Intelligent Computing and Control Systems ICICCS 2017
- [9]. Smart Garbage Monitoring and Clearance System using Internet of Things S. Vinoth Kumar1, T. Senthil Kumaran2, A. Krishna

- Kumar<sup>3</sup> and Mahantesh Mathapati<sup>4</sup> 2017 IEEE International Conference on Smart Technologies and Management 2-4
- [10]. Efficient IOT Based Smart Bin for Clean Environment Murugaanandam. S, Ganapathy. V and Balaji. R 2018 International Conference on Communication and signal processing (ICCSP)
- [11]. Smart Waste Management using Internet-of-Things (IoT) Chitluri Sai Srikanth, R. Anitha 2019
- [12]. IoT-based Intelligent Waste Bin Moath Awarded , Anees Bashir, Tarig Faisal, Irfan Ahmad, and Muhammad Khalil Shahid,2019 advances in Science and engineering technology international conferences (ASET)
- [13]. Smart waste management system 1 Shyamala S.C, 2Kunjan Sindhe, 3Vishwanth Muddy, 4Chitra C N Assistant Professors, International Journal of Scientific Development and Research (IJSDR)
- [14]. KristýnaRybová, Jan Slavík, "Smart cities and ageing population– Implications for waste management in the Czech Republic " -IEEE 2016.

**Cite this article as :**

Sakshi Neema, Prof. Kaushal Gor, "Smart Waste Management Using IoT", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 9 Issue 6, pp. 16-21, November-December 2022. Available at doi : <https://doi.org/10.32628/IJSRSET229529>  
Journal URL : <https://ijsrset.com/IJSRSET229529>