

# Survey on Solid Waste Management-IOT Techniques

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**Abstract-** Today solid waste management disposal is one of the major problem and important challenges in Municipal Corporation. It is one of the primary problems in developing countries. The main issue in solid waste management is overflowing of waste and throwing waste in public areas. It causes various diseases and health hazards. A garbage bin which is kept across the cities in open places gets overflowed by increment of waste each and every day and causes unhygienic condition. To overcome this situation we have proposed a new idea on a particular apartment so that the waste can be disposed in proper way.

**Keywords-** Solid waste management, Municipal Corporation, Apartment, Token system, money.

## 1. INTRODUCTION

Management of solid waste management is a very big challenge in urban areas for developing countries throughout the world. Different kinds of solid waste are thrown by many places such as household waste, agricultural waste, industrial waste, commercial waste, parking and institutions waste an efficient management for solid waste is required to maintain a green and clean environment. The organic waste from the fruits and vegetables are quickly biodegradable and releases bad odor. Some of the insects such as flies, rat and other pests are attached to the discharge of biodegradable waste. These cause various diseases such as cholera, viral infections, and typhoid and also cause skin problem, eye problem, and diarrhea. Due to the improper disposal of waste many diseases are caused due to the presence of many insects like mosquitoes and flies. Now a day's waste are collected and are recycled through various technologies.

The major need for a developing country is the "smart city". There are several ecological factors for a solid waste management includes: pollutions, spread disease and global warming. Now a days, there are several apartments are built in urban areas. To accommodate the population growth in urban areas apartment are built by the government to provide shelter. Integrated and effective solid waste monitoring and management using smart garbage bin using Arduino. The level of the garbage bin is continuously monitored through sensors. This paper has alternative solutions in managing solid waste in apartment.

## 2. LITERATURE SURVEY

**Dr.Vinayak Bharadi, Rutvij Dashputre** proposed a framework to collect garbage in cities in smarter way. Each bin are fitted with sensors

which are used to receive a command based on the garbage level and according to this the priority level is provided. The garbage truck will first reaches the place where the bin is filled depending on the filled level of garbage bins the garbage truck are visited to save time and power[1].**Norfadzlia Mohd Yusof, Aiman Zakwan Jidin , and Muhammad Izzat Rahim** presents the development of smart garbage monitoring system to measure the level of waste generated in the garbage bin and if it reaches the particular destination an alert message is send to the municipality. In proposed system, ultrasonic sensor are used to measure the level of waste produced, GSM module are used to send message to the particular location, Arduino Uno are used to control the system operation. When the bins are filled and almost filled an alert message and warning will be send to the municipality [2].**Kanubhai K. Patel, Savan k. Kachhia, Romil Shah, Dharmendra T. Patel,** developed smart waste bin and solution for effective waste monitoring and management using arduino hardware and the level of the garbage bins are continuously monitored through sensors.LED panel used for displaying the status of the bin whether the level is high ,low and more than middle. Developed smart waste bins and system have initially installed in the campus-sized area [3].**S. Vinoth Kumar, T. Senthil Kumaran, A. Krishna Kumar and Mahantesh Mathapati,**offers an IOT based smart waste clean management system to check the level of waste in the dustbins using sensors. Through GSM/GPRS system altered to concern authorized if detected immediately. Microcontroller used as an interface between the GPRS/GSM and sensor. Android application is to develop and monitor the information related to various level of waste in different location. Android application is developed to find the various level of waste in different locations [4].**Dung D. Vu, Georges Kaddoum,** provides a new

method of smart waste city management to make the city clean and at the same time with low cost. They have used sensor models which are used to measure and detect the data and transmit the data via internet. The data collection includes the trash bin's serial number and geolocation i.e. to identify a person or device by means of digital information processed via the Internet. This is proceeded using some of the technique such as classification, graph theory and regression. This method are managed efficiently by predicting the status of waste ,location of the trash bin is classified and the amount of waste is monitored[5].**Aaditya Jain, Ranu Bagherwal**, worked on the process of solid waste generated at global levels or at local regions. Solid wastw are not disposed properly and these pollute the components of green environment such as land, air and water at global and regional levels. Due to increase in generating waste quantity, there is a increase in urban society. The overflow of garbage in all public places where people move creates unhygienic situations and may cause injurious diseases to nearby person.. To overcome this situation the waste in the dustbins are monitored with the help of sensors and information is passed through GSM/GPRS to required control room. The communication of sensor system with GSM is process through microcontroller. To monitor the information for waste android application are used for different locations [6].

**Namakambo muyunda, muhammad ibrahim**, exploits the solution to provide a smart garbage monitoring which will allow the city authorities for resources in garbage collection and to provide a display place that allow efficient collection of garbage. Sensor device are developed to monitor the status of the garbage bin. The collected sensor data from each of the garbage bin will be displayed on the webpage so that it can alert to the authorities of various status of garbage bin in that particular area. The collection of data is stored for each garbage bins so that it can provide analytical information for each of the garbage collection areas. Route planning should be provided for the collection based on the priorities of each bin and selected fill level. Each node of sensors enter into the database and directly receives any data back from the server. The stored information on the server is made to access through webpage as well as to a mobile phone[7].**Sagnik Kanta, Srinjoy Jash, Himadri Nath Saha**, reviewed garbage monitoring system using IOT. It helps to develop and to eradicate or to minimize the disposal of garbage. Arduino is equipped with the objects, microcontroller transceivers' for the purpose of suitable protocol stack and digital communication to communicate with the uses and one another[8].**Krishna Nirde , Prashant S. Mulay , Uttam M.Chaskar** , proposed a wireless solid waste management system for smart cities which allows municipal corporation to remotely monitor real

time status of the bin through web server to keep cities clean and efficient. Two sensing systems are used in this process such as waste filled level sensing and weight sensing. The waste filled level sensing is based on the measurement and weight sensing is used to estimate the weight. In this method when the bins reaches its maximum level, an alert message will be sent via SMS through GSM module placed at bins so the respective department will send garbage truck where the garbage is to be collected[9].**Dr.N.Sathish Kumar, B.Vijayalakshmi, R. Jenifer Prarthana, A .Shankar**, describes the smart alert system for garbage clearance by giving an alert signal to the municipal web server for instant cleaning of dustbin with proper verification based on level of garbage filling. This is done by using ultrasonic sensor which are interfaced with Arduino UNO which is used to check the filled level garbage in garbage bin and send sends the alert to the municipal web server if garbage bin gets filled. With the aid of RFID tag the driver confirms whether the garbage bin is empty. RFID is a computing technology that is used for verification process and in addition, it also enhances the smart garbage alert system by providing automatic identification of garbage filled in the dustbin and sends the status of clean-up to the server affirming that the work is done. Android application is developed to linked a web server to intimate the alerts from microcontroller to perform remote monitoring of cleaning process done by the workers and notifications are send using Wi-Fi module to android application[10].**P.Siva Nagendra Reddy , R.Naresh Naik, A.Amareshwar Kumar, S.Nanda Kishor**, offers an effective garbage collection using Embedded System. The aim of this method is to collect waste in dumping vehicles and whenever the bin is filled to particular levels the module which is placed on the bin will send an alert message to server node and then from server node the message is again send to the concerned authorities. In this method ultrasonic sensor are used to measure the dust level inside the dustbin. Controller in this design is used by Arduino. Whenever the dust in dust bin reaches the threshold level it will send the information to server node using Bluetooth. Server node receives the values given by the sensing node and it alerts the user by sending an SMS to the concerned authorities through the GSM module. If the hazardous gases released by the Garbage by using MQ4 sensor alerts the user by sending alert message and preventive measures. Bluetooth and Global System for Mobile Communication (GSM) are the Wireless communication modules. The levels of the garbage are detected by the Arduino then the data will be processed. The processed data is transmitted through wireless network to the master Arduino UNO[11].**Prof. Dr. Sandeep M. Chaware, Shriram Dighe, Akshay Joshi, Namrata Bajare, Rohini Korke**, proposed smart garbage monitoring using IOT

helps to eradicate or to minimize the disposal of garbage. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a web page and it also uses ultrasonic sensors placed in the bin to detect the level of the garbage and compare it with the trash bins. It also uses Arduino family microcontroller, LCD screen, Wi-Fi modem for sending data and a buzzer. The system is powered by a 12V transformer. The LCD screen is used to display the status of the level of garbage collected in the bins[12]. **Gaikwad Prajakta, Jadhav Kalyan, Machale Snehal**, worked on the process of automatic garbage collection and information are gathered based on the process of image and GSM module. The aim of this work is fixing a camera at each and every bin at collecting point with load sensor placed at the bottom of the garbage bin. Threshold level is set which compares the output of camera and load sensor. With the help of microcontroller the comparison is done. The level of garbage in the can and from the load cell sensor can be analyzed to know the weight of garbage bin. The threshold level information is processed that is controller checks whether it is exceeded or not. With the help of GSM module the controller sends a message to Garbage collection local office to notify that garbage bin is exceeded its capacity and disposal of waste is required. The authority will send the garbage bin collecting vehicle to collect the garbage with the mechanism of robot[13]. **Md Manik Mian, Xiaolan Zeng, Allama al Naim Bin Nasry, Sulala M. Z. F. Al-Hamadani**, compared municipal solid waste management in china. And other developing countries to analyze and identify the problems of existing MSWM, and evaluated suggestion to overcome the limitations. The main factors of increasing MSWM in China are due to economic growth and rapid urbanization. The increasing rate of incineration unit and disposal capacity is higher than the landfill. A proper taxation system for MSW disposal is not fully implemented in China, which has a negative impact on overall MSW recycling. The comparative study of MSWM, revealed that the source separation MSW collection, effective landfill location and management, high energy recovery from incineration plants, increase waste recycling and disposal in China for MSWM need to be improved[14]. **Monjur Mourshed & Mahadi Hasan Masud & Fazlur Rashid & Mohammad Uzzal Hossain Joardder**, prevents a system for managing the plastic waste production and current plastic waste management system in Bangladesh have been reviewed extensively. The proposed system will execute the quality of plastic waste management offers enormous energy from waste in Bangladesh. There is a lack of different factors such as policy, economic resources, inappropriate technology, regulatory, lack of awareness of the mass community people,

environmental effect, mass community people and inadequately trained manpower to manage the plastic waste properly. The municipal authority had an micro level initiatives could not help to solve the solid waste plastic problem in the cities and towns[15]. **Shinjini Ray, Sayan Tapadar, Suhrid Krishna Chatterjee**, proposes an IOT based optimization technique for garbage collection system to monitor garbage collection. This system is not only to monitor the garbage collection but also optimize it, using machine learning. It utilize is K Means Clustering, widely used in data mining and analytics. Ultrasonic sensor is used to find dustbin's current content level. If the level reaches threshold percentage of the total capacity of the dustbin, it informs our servers, via an online application programming interface and it stores related data – fill time, cleanup time, and location. Algorithm is used to show the locations and also to determine the times of the day, when a regular cleanup should be performed for the maximum possible portion of the day. This process is inspected individually scanning out – items which are the furthest away from its closest centroid; and multiple items related to the same dustbin[16]. **Palaghat Yaswanth Sai**, implements an idea of IOT based on smart garbage bin with the help of water proof sensors which are placed at the particular level of the garbage bin connected to arduino and esp8266 wifi module. When the level of the garbage reaches its particular height it will immediately process the information the information to the web based software as garbage is being filled by using wifi module. If once it reaches its limit the message will be send to the garbage bin driver using GSM[17]. **Monika K A, Nikitha Rao, Prapulla S B, Shobha G**, presents a smart bin with a microcontroller based on the platform of Aurdino Uno board which is interfaced with GSM modem and Ultrasonic sensor. To measure the status of the bin an ultrasonic sensor is placed at the top of the bin. When the dustbin is being filled, remaining height from the threshold height will be displayed with the help of programmed arduino. If the garbage reaches the threshold level ultrasonic sensor will trigger the GSM modem which will continuously alert the authority until the garbage bin gets cleaned[18]. **Ruhin Mary Saji, Drishya Gopakumar, Harish Kumar S, K N Mohammed Sayed**, describes a survey based on on Smart Garbage Management using IoT. This system also involves different smart garbage management ideas that can be simply implemented and it uses sensors, microcontrollers and GSM module are used to assure the cleaning of garbage bins when the garbage bin level reaches its limit. The proper action will be processed if the garbage bin is not cleaned in specific time and the record is send to higher authorities. This process also helps to identify the fake reports and can reduce the corruption in this management. Sensors used here will show the different levels of garbage in

the garbage bins and when the threshold level gets crossed the weight sensors gets activated to send its particular output [19].

### **3. PROBLEM DEFINITION**

In India most of the cities follow the same practice for the disposal of solid waste management. Many cities are collecting waste by using a certain number of trucks which is followed in a fixed route by placing the trucks near to the bin which is allocated for particular area. In current practices there are several techniques used for solid waste management for measuring the level of bin. When the bin reaches its level message will be automatically sent to the corporation. Another method used for solid waste management is by identifying the bin with the color light one is red and another is green. Red color indicates that the bin is filled and green color indicates the bin is empty. Depending on the level of the garbage the truck will first visit the fully filled garbage bins. Some other techniques that are in practice is the garbage level in each of the garbage bin is monitored, garbage collection vehicle position is monitored, distance covered by the garbage bin collector vehicle is monitored.

### **4. THE NEW APPROACH**

This paper presents new techniques for solid waste management to avoid overflowing of garbage bins. This technique will be tested in an apartment. The wastes that are generated in particular house in apartment are calculated based on the weight of the garbage or by identifying with percentage. Based on the weight and capacity of the waste token will be given by the municipality in that particular apartment. By using the token they can receive a certain amount based on their weight of the waste from the municipality. Similarly each and every houses in that particular apartment will be following the same procedure. The advantages of this techniques is we can avoid overflowing of garbage bins, the waste will be disposed in a proper way, there is a less human resources needed.

### **5. CONCLUSION AND FUTURE ENHANCEMENT**

In today's world solid waste management is one of the challenging problems. If the waste is not properly disposed it will cause various diseases such as typhoid, cholera, viral infections etc... The proposed system provide many useful features and to reduce cost of running collection and will be very efficient and there is less human resource. By using this system we can prevent overflowing of bins and throwing garbage waste in public places will also cause diseases and it can also be controlled. The proposed system is done with a single apartment, for future it can be

implemented with many apartments or even in single houses in the streets.

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