

IOT BASED GARBAGE MONITORING SYSTEM

¹Vrushali Ailawar, ²Akshay Wankhede, ³Nihal Kothekar, ⁴Amit Pancham.

¹Assistant Professor, ²Scholar, ³Scholar, ⁴Scholar.

¹Electronics and telecommunication Engineering.

¹Gurunanak Institute of Engineering and Technology, Nagpur, Maharashtra, India.

Abstract : Nowadays, garbage issues have become a serious thing in maintaining the cleanliness of the city. Many of the city areas are still without public garbage bins so the garbage is thrown at the roadside or at the corners in the locality, which creates ugliness at the corners. Due to no garbage bins, garbage is thrown in the small water reservoirs or the drainage water which creates blockages. In the rainy season, these blockages damage the water flowing system and then water overflows through the roads. In some areas the overflowed water blocks all the ways of transport or small floods within the city are generated. The open garbage containers pose problems for the people living in that vicinity as it becomes the breeding ground for insects like mosquitoes, germs, etc. which spreads numerous diseases. These open garbage areas create unhygienic conditions in those areas. In most of the cities the overflowed garbage bins are creating an unhygienic environment. This will further lead to arise of different types of unnamed diseases. This will degrade the standard of living. To overcome these situations an efficient smart garbage management method has to be developed. As the scope of IOT is developing day by day effective methods can be found out easily. Various designs were proposed and have advantages as well as disadvantages. This paper is a survey based on Smart Garbage Management in Cities using IOT

IndexTerms – IOT, Arduino, GSM, GPS, Wi-Fi.

I. INTRODUCTION

According to the UN, between now and 2025, the world population will increase by 20% to reach 8 billion inhabitants (from 6.5 today). With this increase in population, the responsibilities towards waste management also increases. Our waste administration frameworks and our economic situations, even taking care of business, are unequipped for taking care of the developing measures of waste universally. So unless a new paradigm of global cooperation and governance is adopted, a tidal wave of uncontrolled dumpsites will be the principal waste management method, especially in Asia. On the west coast of America, San Francisco leads the way with a landfill disposal diversion rate of 72% and the city has set itself a target of zero waste to landfill by 2020. Dustbin is a common means and a basic need everywhere. It is observed that often the garbage get collected due to irregular removal of garbage present in the dustbin. In this project, a new model for the municipal dustbins which intimates the center of municipality for immediate cleaning of dustbin has been proposed. As the population is increasing day by day, the environment should be clean and hygienic. In most of the cities the overflowed garbage bins are creating an unhygienic environment. This will further lead to the arise of different types of unnamed diseases. This will degrade the standard of living. To overcome these situations an efficient smart garbage management method has to be developed. As the scope of IOT is developing day by day effective methods can be found out easily. Various designs were proposed and have advantages as well as disadvantages. This paper is a survey based on Smart Garbage Management in Cities using IOT. This survey involves various smart garbage management ideas that can be easily implemented. Due to rapid population growth, disorganization of city governments, a lack of public awareness and limited funding for programs, garbage management is becoming a global problem. Internet of Things is nothing but the applications performing with the help of internet access. Its an advanced domain of technology in which all your data is stored on the cloud with real time quick access to data as well as its data mining. While the data is stored on the cloud and people having the internet access, will provide a great access to people on the same application from anywhere in and around the world. Such advancement also equips sensors and routers for gathering and sending data across the internet. Such a domain can be used in all sorts of Pervasive Computing, and Business Intelligence applications.

This paper introduces you to the use of IOT on one such area, that is, Garbage Detection in smart ways using IOT and see how this can also be a major part of developing a city into a smart city. The IOT concepts were proposed years back but still it's in the initial stage of commercial deployment. IOT can be used to provide a platform for smart garbage management. Some of the commonly used methods are implemented using sensors and microcontrollers. Effective actions will be taken if the corresponding authority is not concerned regarding the cleaning of bins. The implementation of smart garbage management system using sensors, microcontrollers and GSM module assures the cleaning of dustbins soon when the garbage level reaches its maximum. If the dustbin is not cleaned in specific time, then the record is sent to the higher authority who can take appropriate action against the concerned contractor. This system also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. This reduce the total number of trips of garbage collection vehicle and hence reduce the overall expenditure associated with the garbage collection. It ultimate helps to keep cleanness in the society. Smart collection bin works with the sensors will show us the various levels of garbage in the dustbins and also the weight sensor gets activated to send its output ahead when its threshold level is crossed. If dustbins are not cleaned in time, the details will be forwarded to higher authority. Different implementation methods are explained in the remaining parts.

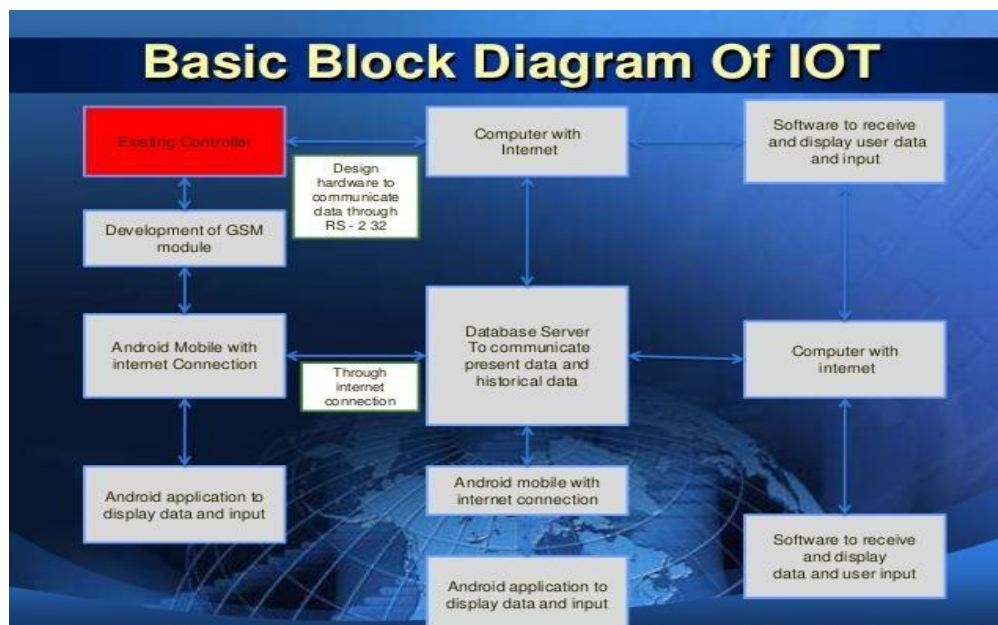


Fig1. Basic blocks of IOT

II. NEED OF PROJECT

The Internet of Things (IOT) shall be able to incorporate transparently and seamlessly a large number of different systems, while providing data for millions of people to use and capitalize. Building a general architecture for the IOT is hence a very complex task, mainly because of the extremely large variety of devices, link layer technologies, and services that may be involved in such a system. One of the main concerns with our environment has been solid waste management which impacts the health and environment of our society. The detection, monitoring and management of wastes is one of the primary problems of the present era. The traditional way of manually monitoring the wastes in waste bins is a cumbersome process and utilizes more human effort, time and cost which can easily be avoided with our present technologies. This is our solution, a method in which waste management is automated. This is our IOT Garbage Monitoring system, an innovative way that will help to keep the cities clean and healthy. Follow on to see how you could make an impact to help clean your community, home or even surroundings, taking us a step closer to a better way of living.

III. LITERATURE SURVEY

The Internet of Things (IOT) shall be able to incorporate transparently and seamlessly a large number of different systems, while providing data for millions of people to use and capitalize. Building a general architecture for the IOT is hence a very complex task, mainly because of the extremely large variety of devices, link layer technologies, and services that may be involved in such a system. One of the main concerns with our environment has been solid waste management which impacts the health and environment of our society. The detection, monitoring and management of wastes is one of the primary problems of the present era. The traditional way of manually monitoring the wastes in waste bins is a cumbersome process and utilizes more human effort, time and cost which can easily be avoided with our present technologies.

This is our solution, a method in which waste management is automated. This is our IOT Garbage Monitoring system, an innovative way that will help to keep the cities clean and healthy. The idea struck us when we observed that the garbage truck use to go around the town to collect solid waste twice a day. Although this system was thorough it was very inefficient. For example let's say street A is a busy street and we see that the garbage fills up really fast whereas maybe street B even after two days the bin isn't even half full. This example is something that actually happens thus it lead us to the "Eureka" moment! What our system does is it gives a real time indicator of the garbage level in a trashcan at any given time. Using that data we can then optimize waste.

[1] By [S Bachan Jeet Singh](#) | Express News Service | Published: 12th May 2017 06:18 AM |

With an aim to give the city a cleaner look, the Greater Hyderabad Municipal Corporation (GHMC) is mulling setting up underground dumper bins. While the present ground-level dumper-bins are an eyesore with overflowing garbage, the proposed bins, which will be operated by hydraulic system, clear the garbage once they get filled.

Mechanism As garbage gets filled up, alert would be issued to the staff concerned, who will alert the driver to empty the bin .Some private organisations under Corporate Social Responsibility (CSR) have come forward for establishing the underground garbage bins

[2] [Evenet Johar](#)¹ , [Rahul Mishra](#)² , [Pranali Redij](#)³ , [Sayali Patil](#)⁴ , [Ms. Jyoti Mali](#)⁵ , IoT Based Intelligent Garbage Monitoring System , International Journal of Engineering and Techniques - Volume 4 Issue 2, Mar-Apr 2018

In this paper, IOT Garbage Management system is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a web page. For this the system uses ultrasonic sensors placed over the bins to detect the garbage level and compare it with the garbage bins depth. The system makes use of Arduino family microcontroller to control every process and Wi-Fi modem for sending data to server. Dustbins are provided with low cost embedded device which helps in tracking the level of the garbage bins and an unique ID will be provided

for every dustbin so that it is easy to identify which garbage bin is full. When the level reaches the threshold limit, the device will transmit the level along with the unique ID provided. These details can be accessed by the concern authorities from their place with the help of Internet and an immediate action can be made to clean the dustbins.

IV. RESEARCH METHODOLOGY

Considering the need of modern technology the smart garbage bin can be expensive, but considering the amount of dustbin needed in India, expensive garbage bin would not be a prior experiment, that is why we have decide to use sensors to reduce its cost and also make it efficient in overall applications. Below is the block diagram for the overall operation.

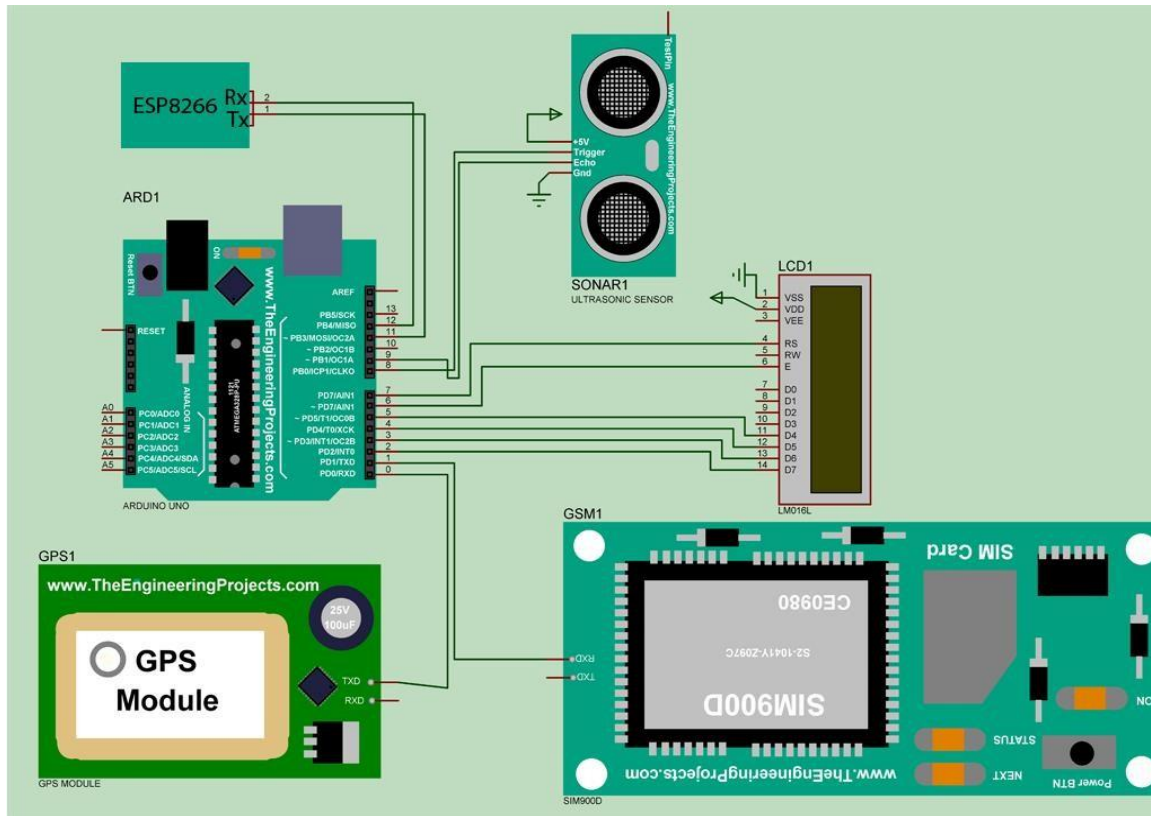


Fig2. Diagram of garbage monitoring system

A. GSM/GPRS Modem

The GSM/GPRS modem utilizes the GSM network to send the location of the accident. The modem can be controlled by microcontroller through AT Command set. The Wavecom Q2403 is proposed for this system. It supports dual frequency (GSM/GPRS 900/1800MHz) with voice function and RS-232 interface. This modem supports all the AT Commands.

B. Wi-Fi module

The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi- ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board.

C. GPS

Global Positioning System GPS helps in both tracking and navigation purpose. Tracking systems is used to keep track of the vehicle without the intervention of the driver. But a navigation system guides the driver to reach the destination without any disruptions. Both tracking and navigation uses the same architecture. As a accident occurs the tracking stem detects the accident prone vehicle and a message is sent to the rescue team through a call or SMS.

D. Arduino

Arduino Uno is a microcontroller board based on the ATmega328P . It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

E. Ultrasonic Sensor

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object. Since it is known that sound travels through air at about 344 m/s (1129 ft/s), you can take the time for the sound wave to return and multiply it by 344 meters (or 1129 feet) to find the total round-trip distance of the sound wave. Round-trip means that the sound wave traveled 2 times the distance to the object before it was detected by the sensor; it includes the 'trip' from the sonar sensor to the object AND the 'trip' from the object to the Ultrasonic sensor (after the sound wave bounced off the object). To find the distance to the object, simply divide the round-trip distance in half.

This sensor is mainly used to detect the temperature of the engine of vehicle. It detects two types of temperatures one is abnormal temperature and other is engine temperature.

IV. PERFORMANCE ANALYSIS

In our project we have implemented three dustbins. Let us consider the output result of one dustbin. The webpage is showing the garbage level of three dustbins. Hardware part is implemented with the dustbin.

Webpage is showing the live level of garbage in dustbins with percentage indication. Dustbin when empty - 0%

Dustbin half – 50%

Dustbin full – 90%

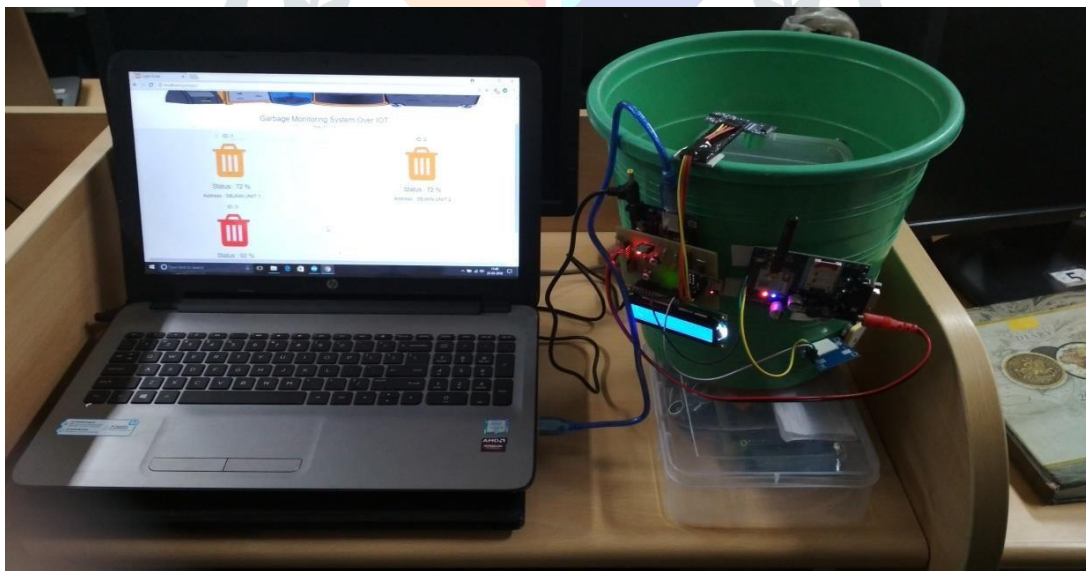


Fig3. Output of our Project

We have used gsm module to send the information of the garbage bins to truck driver so that he can make a trip to collect the garbage from bins. The message is shown in fig below. Message also contains the google map link so that driver can easily find the location of the bin.

Dustbin is full
<http://maps.google.com/maps?&z=15&mrt=yp&t=k&q=21.0947448,79.0016637>

Fig4. Alert Message

This implementation of Smart Garbage Collection System using IoT, assures the cleaning of dustbins soon when the garbage level reaches its maximum. If the dustbin is not cleaned in specific time, then the record is sent to the higher authority who can take appropriate action against the concerned official. This system also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. This reduces the total number of trips of garbage collection vehicle and hence reduces the overall expenditure associated with the garbage collection.

It ultimately helps to keep cleanliness in the society. This is quite a significant project in its originality and concept. We are using Internet of Things theory which gives this project its charisma and uniqueness about the concept. The project aims at cleanliness of the areas where trash bins are located and the very basic management that it contains with it. It aims at advanced management of the whole garbage collection system. We use ultrasonic sensors (details mentioned above) and its other hardware microcontrollers and processors such as Arduino for analyzing the garbage levels and sending information about it to administrators and then garbage trucks are being deployed by them. Another very important aspect of our project is the web portal that is designed in such a way that operators and citizens both will find it user friendly to monitor the garbage information of various places (as discussed above). Hence, all in all, an Iot Concept based software project with electronic devices used, is the one that will be a great service to the world and make it a better place to live in, to some extent.

V. CONCLUSION

Implementation of smart dustbin helps to build clean and healthy society. Smart dustbin continuously monitor the level of garbage and an alert message will be send before it gets overflow. Various features such as durability, affordability, prevention against damage and maintenance issues are addressed when these smart dustbins are designed. This Smart Dustbin can contribute a lot towards clean and hygienic environment in building a smart city.

Implementation of smart dustbin will help the society to solve the problem of garbage overflow from dustbins. After analyzing and investigating this problem related to society, a solution is provided by using the knowledge of fundamental of basic science, engineering and modern tools. "IoT based garbage monitoring system" is an outcome of team work, efficient management and financial skills which helps to keep society and environment clean and healthy.

5.1 Advantage:

- Very simple circuit.
- The HCSR04 sensor is very rugged.
- Helps monitor garbage levels.
- Uses very small amount of electricity.
- Ultimately helps in better planning of garbage pickups.
- Can help in reducing overflowing bins.
- Reduces trips to areas where the bins still have a lot of capacity.

5.2 Disadvantage:

- Cannot detect liquid waste.
- Only detects the top of the garbage level. It wouldn't realize if there is space left.
- GSM module needs a 12v source.

VI. FUTURE SCOPE

In our project, implementation is done only for three bins. Integration of many bins each with a unique ID can be done by implementing the principles of IOT and creating database for each bin which can be maintained by using SQL technology and a login webpage is created to ensure authorized entries. Apart from this, differentiation can be made between dry trash bin and wet trash bin collecting plastic dry waste and biodegradable waste respectively. To implement this methane and smell sensors can be used. This helps in distinguishing the waste at the source and hence reducing the requirement of manpower.

To enhance it further, an automated system can be developed which is able to pick up waste in and around the bin, segregate them and put them in respective bins.

REFERENCES

- [1] Vikrant Bhor, Pankaj Morajkar, MaheshwarGurav, Dishant Pandya, —Smart Garbage Management Systeml, March 2015.
- [2] Microtronics Technologies, —GSM based garbage and waste collectionbins overflow indicatorl, September 2013.
- [3] S. Thakker and R. Narayanamoorthi, "Smart and wireless waste management," Innovations in Information, Embedded and Communication Systems (ICIIECS), 2015 International Conference on, Coimbatore, 2015.
- [4] Riondaet al., "UrVAMM — A full service for environmental-urban and driving monitoring of professional fleets," new Concepts in Smart Cities: Fostering Public and Private Alliances (Smart MILE), 2013 International Conference on, Gijon, 2013.
- [5] Narayan Sharma, Nirman Singha, Tannoy Dutta, —Smart Bin Implementation for Smart Citiesl, International Journal of Scientific & Engineering Research, vol 6, Issue 9, 2015, pp-787-789.
- [6] Yusuf Abdullahi Badamasi, The Working Principle Of An Arduino, Electronics, Computer and Computation (ICECCO), 2014 11th International Conference on 29 Sept.-1 Oct. 2014.
- [7] Pedro Reis , Rui Pitarma, Celistino Goncalves, Intelligent System for Valorizing Solid Urban Waste, Filipe Caetano Faculty of Engineering UBI University of Beira Interior Covilha, Portugal, 2015.
- [8] P.Suresh1J. Vijay Daniel2, Dr.V.Parthasarathy4” A state of the art review on the Internet of Things (IoT)” International Conference on Science, Engineering and Management Research (ICSEMR 2014).
- [9] Arkady Zaslavsky, Dimitrios Georgakopoulos” Internet of Things: Challenges and State-of-the- art solutions in Internet-scale Sensor Information Management and Mobile Analytics” 2015 16th IEEE International Conference on Mobile Data Management
- [10] Theodoros.Anagnostopoulos1,Arkady.Zaslavsky 2,1, Alexey Medvedev1, Sergei Khoruzhnicov1” Top-k Query based Dynamic Scheduling for IoT enabled Smart City Waste Collection” 2015 16th IEEE International Conference on Mobile Data Management.