

Smart Garbage Monitoring System: Review

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Abstract: Waste management is a big issue in the world. Many countries provide different methods for garbage management and maintain cleanliness of surroundings. In India there is improper waste management and people also not maintain the cleanliness of environment. At many places the garbage containers are overflow but GCT (Garbage Collection Truck) not arrives. Also with the increase in the population of country current garbage collection system not capable to maintain the green environment.. Here we actually use arduino board connected to an ultrasonic sensor and a Wi-Fi module and this entire system is connected to every single bin inside the campus area. As the Internet of things (IoT) is giving us unique solutions to everyday problems, we propose a smart garbage alert system for efficient waste monitoring. The proposed system will consist of waste bins that are equipped with ultrasonic sensors ,DHT 11, Gas sensor which are interfaced with Arduino Uno and a Wi-Fi module. The system will collect the waste fill level status and upload the data to database. This data will be used to represent the fill levels of all the bins on the android application .The ultrasonic sensor is directed towards the face of the bin and whenever the bin is less than 3 cm empty the status of the bin will be shown as full, otherwise it will be shown as empty.. Once a bin gets filled, notification will be sent to the appropriate client based on their location. Based on the number of filled bins an optimized pickup path will be displayed to cover all the filled bins. This system will thus eventually reduce the manual process of verification of the garbage fill levels.

Keywords: Smart Devices; Internet of Things, Android ; Garbage Monitoring System.

I. Introduction

A healthy environment is necessary if you want to stay healthy. Though the world is in the stage of upgradation there is yet another problem that has to be dealt with which is “Garbage”. In most of the places overflowing of garbage bins takes place. This gives rise to various diseases as large number of insects and mosquitoes breed on it. In India the absence of efficient waste management has led to some serious issues, it is a big challenge faced by most of the regions of India. Hence smart garbage monitoring system is a system which can eradicate the problem or can reduce it to the minimum level.

In this project, we are going to propose a system for the immediate cleaning of the dust bins. As dustbin is considered as a basic need to maintain the level of cleanliness in the city, so it is Very important to clean all the dustbins as soon as they get filled. We will use ultrasonic Sensors for this system. The sensor will be placed on top of bin which will help in sending the information to the office that the level of garbage has reached its maximum level. After this the bin should be emptied as soon as possible. The concept of IOT when used in this field will result in a better environment for the people to live in. No more unsanitary conditions will be formed in the city. With the help of this system minimal number of smart bins can be used Around the whole city and the city will still be much cleaner. There has been an unprecedented growth in the number of devices being connected to the Internet since past few years. All these devices connected to the internet are part of the IOT Infrastructure which can communicate with each other. The IOT network consists of Embedded electronics, sensors and software that allows these devices to send and receive data Among each other. This is why it is beneficial to use such an existing infrastructure for Designing the proposed security system.. If the bin doesn't get emptied on time then the environment becomes unhygienic and Illness could be spread. The proposed system will help in removing all these disadvantages. The real-time information can be gained regarding the level of the dustbin filled on the system Itself. It will also help in reducing the cost as the employees will have to go only at that time when the dustbin is full.

II. Literature Survey

Paper[1]: FetulhakAbdurahman, SileshiAweke , Chera Assefa “Automated Garbage Monitoring System Using Arduino”iosr Journal of Computer Engineering (IOSR-JCE) , Volume 20, Issue 1, Ver. I (Jan.-Feb. 2018), PP 64-76

In this paper, the level of the garbage is detected with the help of ultrasonic sensor and sent to the authorized agency for garbage collection through GSM system. PIR sensor is used to detect the motion of the people coming to the garbage bin with trash while the bin is at full status and block adding of any more garbage to the bin through informing them by speaker. The GSM and the peripheral sensors used are interfaced through the Arduino microcontroller. A GUI is also developed to monitor the desired information related to the garbage bins for different selected locations. Depending on the received messages through the GSM at control room it is displayed on LCD and the authorized person inform the drivers to collect the garbage on time. This will capably help to monitor the garbage collection to make the environment smart, clean and safe.

Paper[2]: Swarna m1, k j anoop2, k kanchana “Iot Based Garbage Box Monitoring System” International Journal of Pure and Applied Mathematics Volume 119 No. 15 2018, 2713-2723.

In this paper, new world of system and network model is being done by the increase of various strategies. More over smart strategy are rooted in the surroundings to check and collect exact information.IOT can also be implemented in the field of waste management system. Trash management involves not only the gathering of the trash in the ground but also the transfer and removal to the suitable locations. This article represents a comprehensive and detailed investigation of waste management models. Exclusively, this paper focuses on the execution of smart procedure as a key enabling technology in contemporary trash management system.

Paper[3] :Dr. K. Alice Mary, Perreddy Monica, A. Apsurrunisa, Chathala Sreekanth “IOT Based Garbage Monitoring System” International Journal of Scientific & Engineering Research, Volume 8, Issue 4, April-2017

In this paper, IOT Based Intelligent Garbage Monitoring system is a newfangled system which will 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. This system uses two ultrasonic HC-SR04 sensors placed over the bins to track down the garbage level and correlate it with the garbage bins depth. The system makes use of 8051 microcontroller to control every process and Wi-Fi modem for sending data to server. Dustbins are provided with economical implanted components which helps in tracking the level of the garbage bins and an unparallel ID will be provided for every dustbin so that it is easy to find which garbage bin is full. When the level reaches the threshold limit, the device will transmit the level along with the unique ID provided. This data can be retrieved by the person who has authority to access the data from their place with the help of Internet and an immediate action can be made to empty the dustbins.

Paper[4]:Ashima Bajaj and ,Sumanth Reddy “Garbage Monitoring System Using IOT” International Journal of Pure and Applied Mathematics Volume 114 No. 12 2017, 155-161

In This paper Garbage Monitoring system using IOT is a very innovative system which will help to keep the cities clean. This system makes use of microcontroller, LCD screen, zigbeemethodology for sending data. Ultra sonic sensors are used to detect the level of garbage collected in the bins. The LCD screen is used to display the level of garbage collected in the bins.

Paper[5]: Parkash, Prabu, “IOT Based Waste Management for Smart City”, International Journal of Innovative Research in Computer and Communication Engineering, Vol. 4, Issue 2, February 2016.

In this paper there are multiple dustbins located throughout the city or the Campus,these 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 in the city 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.

Paper[6] :Andrea Zanella, Nicola Bui, Angelo Castellani, Lorenzo Vengelist, and Michele Zorzi, “Internate Of Things for smart cities” IeeeInternate Of Thingsjournal, Vol. 1, No. 1 February 2014.

In this paper ,we focus specially to an urban IOT system that, while still being quite a board category, are characterized by their specific application domain. Urban IOTS, in fact , aims at exploiting the most advanced communication technologies to support added value services for the administration of the city and for the citizens. This paper hence provides a comprehensive survey of the enabling technologies, protocol, and architecture for an urban IOT.

Paper[7]: Kanchan Mahajan1, Prof.J.S.Chitode “Waste Bin Monitoring System Using

Integrated Technologies”International Journal of Innovation Research in Science, Engineering and Technology Vol. 3, Issue 7, July 2014

In this paper ,Zigbee and Global System for Mobile Communication (GSM) are the latest trends and are one of the best combination to be used in the project. Hence,a combination of both of these technologies is used in the project . To give a brief description of the project , the sensors are placed in the common garbage bins placed at the public places. When the garbage reaches the level of the sensor, then that indication will be given to ARM 7 Controller. The controller will give indication to the driver of garbage collection truck as to which garbage bin is completely filled and needs urgent attention. ARM 7 will give indication by sending SMS using GSM technology.

Paper [8]: Harshita A. Gawad*, SurajKadam, Dona Jain, Nirav Patel “An IOT based Dynamic Garbage Level Monitoring System using Raspberry-pi”, Harshita A. Gawad. Int. Journal of Engineering Research and Application ISSN : 2248-9622, Vol. 7, Issue 7, (Part -7) July 2017, pp.30-34.

In this paper, there are multiple dustbins located throughout the city or Campus, these dustbins are provided with low cost device which helps in tracking the level of garbage bins and a unique ID will be provided for every dustbin so that it is easy to identify which garbage bin is full. When the level reaches 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.

Paper[9]: Manasi Waikar1 , Rajat Lashkare2 , Rushabh Mutha3 , Shreekar Vidwans4 “n Solid Waste Management using SmartBin”, International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3297: 2007 Certified Organization) Vol. 4, Issue 11, November 2016.

This paper describes the waste management techniques using technologies like GIS, GPS, RFID, etc. It would be easy to calculate the fill level estimations using these Techniques, according to the input of smart system efficient route can be decided for garbage collection and would help to reduce the human intervention in waste management.

Paper[10]: Ruhin Mary Saji1 , Drishya Gopakumar2 , Harish Kumar S3 , K N Mohammed Sayed4 , Lakshmi s5 “A Survey on Smart Garbage Management in Cities using IoT”, International Journal Of Engineering And Computer Science ISSN: 2319-7242 Volume 5 Issue 11 Nov. 2016, Page No. 18749-1875.

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.

Paper[11]: Naman Sharma, Nikhil Mishra , Paurvi Gupta “IoT based garbage monitoring system”, International Journal of Advance Research, Ideas and Innovations in Technology ISSN: 2454-132X Impact factor: 4.295 ,Volume 4, Issue 2.

In this paper, we will portray savvy dustbin in view of Arduino Nano, Ultrasonic sensor, LoLin NodeMCU and Flame sensor which are interfaced with Mobile Application through Web Server to put on brilliant dustbin which will quantify the status of the dustbin. This system screens the trash canisters and educates about the level of waste gathered in the junk containers. This will likewise send status of bins to waste accumulation vehicles.

Paper[11]: SWARNA M 1 , K J ANOOP 2 , K KANCHANA3 “WASTAGE MONITORING SYSTEM USING IOT”, International Journal of Pure and Applied Mathematics Volume 119 No. 15 2018, 2705-2712.

This paper gives a inclusive and detailed survey of waste management models. Entirely, this paper suggests the topology of waste management system which is the smart procedure as a key enabling expertise in existing waste management system.

Paper[12]: Mokshada V. Patil1 , Snehal M. Gajbhiye2 “Internet of Things Based Garbage Bins Detection Systems”, International Journal of Science and Research (IJSR) Volume 6 Issue 4, April 2017.

In this paper, The system is divided into three segments, the first segment consists of bins with sensor nodes installed in it that are moisture, ultrasonic and odour sensor interfaced with microcontroller. Second segment consists of Wi-Fi module for data transfer to the server and third segment is web page. The real time bin status and corresponding notifications are displayed on web page. Web page is developed using PHP and database is generated along with the priority algorithm embedded in it for more efficiency.

Paper[13]: Ms. Puja k. Dhotre1 , Ms. A. L. Borker2 “Energy Efficient Smart Garbage Monitoring System for Smart City using Internet of Things”, International Journal for Research in Applied Science & Engineering Technology (IJRASET) Volume 6 Issue II, February 2018.

This paper presents design and implementation of smart garbage monitoring system using IoT. Monitoring of garbage level only is not sufficient to make city environment clean odour free. Because if level of garbage bin remain below threshold value for long period then it causes odour, and it is unhygienic to people

living nearby. To avoid this we need to monitor gases generated at garbage bin. One of the objectives of design is sensing unit at garbage bin has to be battery operated. So that it can be portable and easy for connecting to garbage bin when there is no power supply readily available.

Paper[14]: Aishwarya Sureshkumar1, Sayli Dixit2 “IoT BASED GARBAGE MONITORING SYSTEM”, Journal of Emerging Technologies and Innovative Research (JETIR), June 2017, Volume 4, Issue 06.

In this paper , We will be implementing the k-means clustering algorithm to form the clusters of the days according to the percentage of garbage collected so it will be easy to predict the garbage collection and notify accordingly. These details can be accessed by the authorized personnel from their place and action can be taken in shorter time to maintain the dustbins.

Paper[15]: Akshayraj Ashok Sawant1, Prof. Amutha Jeyakumar2 “IOT BASED SMART GARBAGE PROCESSING”, International Journal of Advanced Research in Computer Science and Electronics Engineering Volume 7, Issue 6, June 2018.

In this paper, system consists of two separate bins for dry and wet waste. Organic waste basket is used for wet waste. It gets decomposed into manure in that bin itself. Garbage level in the both the bins can be monitored continuously with the help of sensor system from any remote location over GUI developed. Gas sensor along with buzzer used in dry waste bin helps to inform presence of harmful gas and presence of organic substances if added mistakenly. I

III. Working Principle

The garbage containers transmit signals to indicate that they are over 80% or 90%full and should be emptied. Via the mobile communications network, the signals are sent to a web based software application used by the waste management company.

In the software, the capacity of the container is indicated, which is taken as a basis to plan the best route for waste collection garbage trucks travel only to those containers that actually need to be emptied.

A robust ultrasonic sensor is installed in the garbage container and detects the filllevel regardless of what has been deposited inside. The whole system contains ultrasonic sensor, arduino board, DHT 11, gas sensor,wifi module .The sensor is fixed on to the bread board. the connection between the Arduino board and sensor is made with the help of connecting wires. The working program is fed into the arduino board. The wifi module is also connected to the same arduino board with the help of wires.. The block diagram is shown in figure 1.

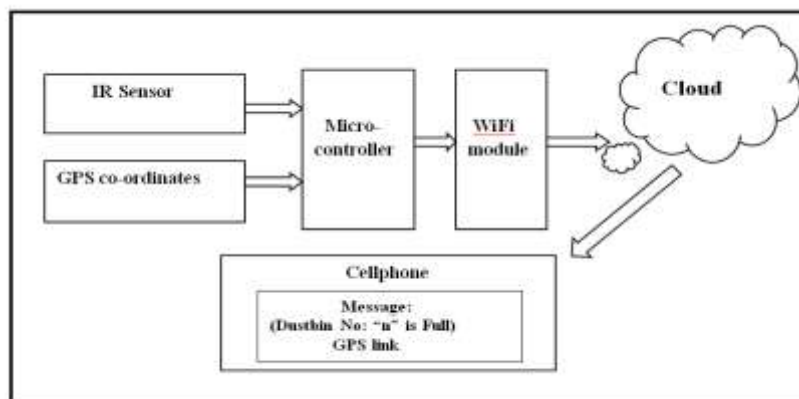


Fig1- Working Block Diagram of Garbage Monitoring System

1 .Hardware specifications

3.1. Arduino:

Arduino was born at the Ivrea Interaction Design Institute. Arduino Uno is a microcontroller board based on the ATmega328 and it is brain of system. It is open source, computer hardware and software device. It sense and control objects in the physical world. Its required 5V power supply. It is basically microcontroller. In this paper Arduino is use as a brain, also all the system which were operated on arduino.



Fig 2- Arduino

3.2. Ultrasonic Sensor:

The Ultrasonic Sensor sends out a high-frequency sound pulse and then times how long it takes for the echo of the sound to reflect back. The sensor has 2 openings on its front. One opening transmits ultrasonic waves, (like a tiny speaker), the other receives them, (like a tiny microphone). The speed of sound is approximately 341 meters (1100 feet) per second in air. The ultrasonic sensor uses this information along with the time difference between sending and receiving the sound pulse to determine the distance to an object.



Fig 3 -Ultrasonic Sensor

3.3. WI-FI Module :

This module has a powerful enough onboard processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development upfront and minimal loading during runtime. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts. There is an almost limitless fountain of information available for the ESP8266, all of which has been provided by amazing community support. In the Documents section below you will find many resources to aid you in using the ESP8266, even instructions on how to transforming this module into an IoT board. internet of things (IOT). Here ESP8266 Module is used and as well as it is a wireless network. It is a WIFI Module. ESP is 3.3v device and never connect to 5V it will get damage.



Fig 4 - Wifi Module

3.4. IR Sensor:

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. An infrared sensor circuit is one of the basic and popular sensor module in an electronic device.



Fig 5 – IR SENSOR

3.5. DHT 11 :

The DHT11 is a commonly used Temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers. The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of $\pm 1^\circ\text{C}$ and $\pm 1\%$.



Fig 6- DHT 11

3.6. Gas sensor :

A gas sensor is a device which detects the presence of different gases in an area, especially those gases which might be harmful to humans or animals. The developments of gas sensor technology have found wide applications in environmental monitoring, protection, etc. It is well known that properties of the sensing materials such as surface area, agglomeration and porosity greatly affect the gas-sensing characteristics, such as sensitivity, selectivity, time response, stability, durability, reproducibility and reversibility. Various types of materials such as semiconductors, polymers and organic/inorganic composites have been used as sensing material to detect the targeted gases based on various sensing techniques and principles. A higher specific surface of a sensing material leads to a higher sensitivity, therefore many techniques have been adopted to increase the specific surface of material, especially to form the nanostructures. Thus, large specific surfaces are expected to be ideal candidates as the structure of sensing materials. Recently electrospun fiber-based gas sensors have attracted much attention as the surface area-to-volume ratio of nanofibers is very high.



Fig 7 - MQ3 gas sensor

IV. Conclusion

A Smart Dustbin proposed by , based on IoT in which the smart bin was built on a platform which was based on Aurdino Uno board which was interfaced with a GSM modem and an ultrasonic sensor. The second system , suggests the method for garbage management which is as follows. The bin was interfaced with a system based on microcontroller which had IR wireless systems with a central system that showed the current status of the garbage in the bin. Next system suggests The author proposed a method for organizing the collection of the garbage in the commercial and residential areas of the cities . In this system, the level of garbage in the bin was detected by the ultrasonic sensor which will send the data to the control room using the

GSM module. Next one proposed Decision Support System which would be used for garbage collection in the cities. This system handled the ineffective waste collection in the inaccessible areas of the city. In this paper an Arduino sensor based automated garbage monitoring system is developed to monitor the garbage through the city. The system is more effective in informing the municipalities about the status of the garbage at garbage bin location when the status of the garbage becomes full. Measuring the level of the garbage and informing the society and municipalities about at which level the garbage is and informing the driver to collect the garbage is the main feature that is developed in the project which makes the system more reliable and efficient.

References

- [1]. Fetulhakabdurahman, Sileshiaweke ,Cheraassefa “Automated Garbage Monitoring System Using Arduino” iosr Journal of Computer Engineering (IOSR-JCE) , Volume 20, Issue 1, Ver. I (Jan.- Feb. 2018), PP 64-76.
- [2]. Swarna m1, k j anoop2, k kanchana “Iot Based Garbage Box Monitoring System” International Journal of Pure and Applied Mathematics Volume 119 No. 15 2018, 2713-2723.
- [3]. Dr. K. Alice Mary, Perreddy Monica, A. Apsurrunisa, Chathala Sreekanth “IOT Based Garbage Monitoring System” International Journal of Scientific & Engineering Research, Volume 8, Issue 4, April-2017
- [4]. Ashima Bajaj and ,Sumanth Reddy “Garbage Monitoring System Using IOT” International Journal of Pure and Applied Mathematics Volume 114 No. 12 2017, 155-161
- [5]. Parkash, Prabu, “IOT Based Waste Management for Smart City”, International Journal of Innovative Research in Computer and Communication Engineering, Vol. 4, Issue 2, February 2016.
- [6]. Andrea Zanella, Nicola Bui, Angelo Castellani, Lorenzo Vangelista, and Michele Zorzi, ”Internate Of Things for smart cities” IeeeInternate Of Thingsjournal, Vol. 1,No. 1 February 2014.
- [7]. Kanchan Mahajan , Prof.J.S.Chitode, “Waste Bin Monitoring System Using Integrated Technologies” International Journal of Innovative Research in Science, Engineering and Technology (An ISO 3297: 2007 Certified Organization) Vol. 3, Issue 7, July 2014.