

Trash Bin Monitoring System By means of Assimilated Expertise

R. Meena Gomathi

M.E. Computer Science and Engineering, K.L.N. College of Engineering, Tamilnadu, India

ABSTRACT

The Internet of Things (IoT) will be competent to integrate evidently and flawlessly a great number of diverse structures, and provide an open access to designated subcategories of data for the progress of a plethora of digital amenities. Construction of a general architecture for the IoT is henceforth a compound task, predominantly for the reason that the extremely large variety of devices, link layer technologies, and services that may be involved in such a scheme. One of the chief concerns with the environment has been solid waste management, which in addition to distressing the stability of the environment also has contrary effects on the well-being of the humanity. The uncovering, observing and administration of litters is one of the prime complications of the present era. The old-fashioned way of manually monitoring the wastes in trash bins is an intricate, cumbersome procedure and employs more human strength, time and budget which is not apt for the contemporary expertise in any way. The method recommended in this paper is an innovative system in which waste management is computerized. This project of garbage monitoring system is a state-of-the-art system, which will help to keep the cities uncontaminated, and also the key feature of the proposed work is to monitor the garbage bins and inform about the level of garbage collected in the garbage bins with the help of sensors that transmit it to the server at the other end. Thus the received information is sent to the garbage collection vehicles in-order to collect the waste.

Keywords : Arduino microcontroller, Solids Waste management, Garbage bin monitoring, Application Resource Manager (ARM), Ultrasonic Sensor, RF Transmitter, Receiver.

I. INTRODUCTION

One of the chief difficulties that chance upon by way of metropolises and towns recount to administration of Municipal Solid Waste (MSW). Waste masses are amassing and municipal authorities are not competent to modernize or scale up the amenities crucial for appropriate administration of such litters. In many cities and municipalities, trash is littered on streets and foot-paths. Residents are also not accustomed to practice the existing storage facilities (dust bins) set up by the authorities in a better way. At large, scarcity of organized structure of house-to-house collection of waste has created the littering habits.

Trashcan is a conventional and vital necessity in all places of the world. Owing to the intermittent removal of the garbage present in the trashcan, the garbage in it is amassed. This upshot in the inopportune waste management, which in turn grounds the air effluence and soil contagion. This has an adverse result

on the human well-being. According to assessment garbage accretion causes 41% of the air fumes. Air contamination causes various respiratory snags like asthma, chronic obstructive pulmonary disease (COPD) etc. Amassing of garbage also pointers to the breeding of mosquitoes and houseflies which advances roots to various disease such as malaria, dengue etc. There are millions of people at present suffering from asthma for which foul reeking of garbage is also a vital cause. Garbage consists of innumerable undesirable constituents that are generated from manufacturing, farming or excavating processes or from the domestic activities. India generates about 65 million tonnes of trash every year, out of which 10-12 million tonnes of garbage are generated by the metropolitan cities like Delhi, Mumbai, Chennai, Bangalore, Hyderabad and Kolkata. There is absence of apposite services to bring together, treat and dispose the waste engendered.

Due to this, the management of Municipal Corporation for solid waste management is going through a risky phase. The generated waste is released

in the proximate unoccupied spaces deprived of taking any deterrent or operational control, which unsympathetically distresses the environment of the places close to it and therefore affects the health of the populace. Waste management is an immense challenge for more or less all the countries in the world.

A competent mode for the waste management is essential to preserve the environment. "A clean India would be the best honour India could pay to Mahatma Gandhi on his 150 birth birthday in 2019," said Shri Narendra Modi as he launched the Swachh Bharat Abhiyan(SBA) in New Delhi. On 2nd October 2014, SBA was launched throughout the length and breadth of the country as a national movement. The campaign aims to accomplish the dream of a 'Clean India' by 2nd October 2019. SBA is a prominent part in making India a clean country and the foremost objective to impart citizens to lessen the pool of waste and to preserve the surrounding unpolluted. The SBA Mission is an operation in India that targets to clean the streets, roads and substructure of India's metropolises, smaller municipalities, and rural regions. The objectives of Swachh Bharat as well embrace eradicating the barriers through the construction of household-owned and community-owned toilets and instituting a liable mechanism of monitoring toilet use. Run by the Government of India, the operation intends to attain an Open-Defecation Free (ODF) India by 2 October 2019, the 150th anniversary of the birth of Mahatma Gandhi, by constructing 12 million toilets in rural India. The scheme projected in this paper is a technique to contribute in making India clean.

➤ **Origins of Solid Wastes:**

The resources that are collected under the term solid waste include many diverse substances from a multitude of sources. The sources of solid wastes are reliant on the socioeconomic and technological heights of a society. Most people can recognize solid waste when they empty their trashcans. There are much more household wastes that are considered to be solid waste than realized. In all circumstances the subsequent sources are world-wide:

1. Residential: generated from living households (domestic), generally contain non-hazardous solid wastes; kitchen waste.

2. Agricultural: solid wastes due to agricultural activities: food residues, animal dung, crop residues,

etc. Such wastes are usually non-hazardous and negligible.

3. Commercial: wastes generated from business establishments: food establishments, shops, etc. that produce normally non-hazardous waste such as paper, cardboard, wood and toxic waste from medical products, other industrial waste that are harmful to the environment may also include metals and plastic.

4. Industrial wastes: from several forms of industrial procedures. The nature of the waste rests on the kind of industry and kind of raw material involved. There may be toxic and hazardous wastes that have adversarial effects to the surroundings.

5. Institutional solid waste: generated from public and government associations: offices, religious institutes, schools, universities, etc. usually not unsafe.

6. Hospital solid wastes: discarded, unwanted solid wastes from hospitals. It entails of both non-hazardous and hazardous discards. The above grouping aids to classify whether the waste is hazardous or not.

II. LITERATURE SURVEY

Kanchan Mahajan et al. recommended a structure, which has integrated Zigbee, GSM and ARM7 controller for designing the structure. In this system, the sensors are placed in the bins. When the trash reaches certain level, the sensed data by the sensor will be sent to the controller and the controller will give an indication to the driver of garbage collection truck about which garbage bin is totally occupied. This helps to collect the filled garbage from the bins instantaneously as the processor will also drop a message using GSM [1]. The system developed in [1] is comparatively less operational in providing accurate levels of bins being occupied by junk when equated with our TRASH BIN monitoring structure using arduino that has outperformed in sensing the levels and sending immediate messages to the concerned authorities to empty the bins

Md Shafiqul Islam et al. have introduced a system containing of Radio Frequency Identification (RFID), Global Position System (GPS), General Packet Radio Service (GPRS), Geographic Information System (GIS) and web camera. Each bin is committed with a RFID tag, which may possibly aid the RFID reader in collection truck to get the info from the sensor in the trash can. All the information of the central

server would be restructured routinely through GPRS communication module [3].

Kanika Rastogi et al., have conferred about the waste management and snags related with the waste management. They have also emphasized on diverse policies introduced by the government for waste management. The solution for refining the waste management problem is by moving in the direction of mechanization. They also projected 3 methods which could be attained in forthcoming years. It embraces a sensing expertise which could sense the level of the discarded materials in the bins and indicate the concerned authority about it and subsequently quick action could be taken [4].

Ch Raghmani Singh et al., in [5] highlighted an overview of the current municipal solid waste management system of Thoubal Municipality and the aim of the study is to determine the characterization of waste and current study of management activities. They have also given some suggestions that may be beneficial to the authorities in disposal of the waste.

Vikrant Bohr, proposed a model which can screen the level of the trash with the help of the sensors and can transfer the info to the authority with the support of a GSM structure. These sensors and GSM are interfaced by means of a microcontroller. A GUI is as well established to screen the anticipated info of the dustbins retained at diverse places [6].

Narayan Sharma et al. presented a system for managing the waste management system of entire city with the help of smart bins. These smart bins are equipped with number of sensors and a PIC microcontroller is used which helps to record the status of the solid waste collected in the bins. It is also equipped with GSM SIM900 with the help of which the information related to the level of the garbage is end to the authorities [7].

III. PROPOSED WORK

This project is related to “Smart City” by means of “Smart Dustbins” (Trash Cans). Implementation of this Smart Dustbin can avert scattering of litter on the streets due to surfeit wastes in the dustbins and as a result can thwart various diseases to a great degree and effects in the clean environment

in the metropolis and small municipalities. Hygiene and sanitation are the need of the hour, as it is quintessential for smart standard of living and it instigates with the trash bins. This project is established with the help of a microcontroller, ultrasonic sensor, in addition to a RF transmitter and receiver. The ultrasonic sensor would be placed in the common garbage bin which uninterruptedly monitors the level of waste. The microcontroller and the controller will log the level of the junk with the assistance of the RF transmitter and receiver directs the data to the server on the other side which is located at the authority’s workplace. When the level of garbage reaches above a threshold level it will be indicated to the concerned authority that the garbage bin needs to be emptied.

The haphazard discarding of trashes and leachate from landfills pollutes the surface and groundwater provisions as well as the surrounding land assets. It also clogs drains and water system and heads to flood during downpours. Mumbai experienced a flood in 2006 which was relatively due to clogged sewers. Insects and rodents are engrossed to Municipal solid waste (MSW) and can spread infections and diseases such as cholera, dengue fever and plague. Consuming water tainted by solid waste for shower, crop irrigation, and as drinking water can unquestionably lead individuals to ailment. Health menace specifically for those who live near the landfills has been evident from various international reports and the average life expectancy of people dwelling in the zone near landfills have fallen severely, which is a distressing signal.

Apart from the fires in the dumping ground, the detrimental gases emanated from biomedical waste entities augment to high air effluence in the region. The municipalities and the metropolis are taking various paces to preserve the cleanliness of the cities. Improved consideration has been set by the government in recent years to handle this problem in non-toxicated and sanitized manner. However, waste management is becoming a pernicious issue as to the increased industrial undertakings and swift urbanization. To evade such circumstances this project is planned to make a microcontroller based system, which can endlessly screen the status of the bins positioned at public dwellings. This paper presents technical solutions to resolve the above-cited problem. Solid waste these days encompasses many constituents such

as plastics that are not readily degradable and toxic materials, mainly innumerable sorts of chemical discards produced by the industry. Likewise, the amount of harmful waste produced has been undergoing dramatic transformation. Moreover, industries escalate their annual discharges of toxic chemicals directly into the surroundings.

This paper delivers a system, which is a very innovative structure that will help to retain the cities uncontaminated. This system screens the trash bins and notifies about the level of junk collected in the garbage bins via a web page. For this, the system uses ultrasonic sensors positioned over the bins to identify the garbage level and equate it with the garbage bins depth. The system makes use of Arduino family microcontroller, LCD screen, Wi-Fi modem for transferring data and a buzzer. The system is driven by a 12V transformer. The LCD screen is used to show the status of the level of garbage collected in the bins. Whereas a web page is built to display the status to the user/authority on the other side who is monitoring it. The web page contributes a graphical view of the garbage bins and highlights the junk collected in different colours in order to indicate the level of junk collected. The LCD screen shows the status of the garbage level. The system puts on the buzzer when the level of garbage collected crosses the set limit. Thus, this system aids to keep the city clean by updating about the garbage levels of the bins via providing graphical image of the bins through a web page.

In [9] for detecting the garbage, weight sensor could be used as it provides the weight of the garbage in the dustbin but it doesn't provide any info about the level of the garbage in the trash can. Therefore, in [9] they have used Infrared (IR) sensor for garbage detection. IR sensor radiates light which is imperceptible to the human eye since it is at infrared wavelengths, but it can be detected by electronic devices. IR transmitter consists of LED which send the IR beam. Technology use Infra-red sensor (IR), Microcontroller, Global System for Mobile (GSM), graphical user interface (GUI). Infrared sensor (IR), Global System for Mobile (GSM). They only use GSM network. Power and internet supply continues. Smart garbage management system using IR sensor, microcontroller and GSM module. This system assures the cleaning of dustbins soon when the garbage level reaches its maximum.

ADVANTAGES OF THE PROPOSED SYSTEM

- Lessens the time and lowers the fuel consumption as the trucks are sent only to the filled garbage cans.
- Decreased noise, traffic flow and air smog as an outcome of fewer trucks on the roads.
- The smart operating system enables two way communication between the dustbins set up in the city and service operator. Thus, the focus is only on gathering of route based filling level of the containers.
- The sensors installed in the containers deliver real time info on the fill level. This info aids to fix when and where to prioritize the collection. In this way both service providers and citizens profit from an enhanced system which upshots in foremost cost savings and lessens urban pollution.

IV. SYSTEM ARCHITECTURE

Arduino is best chosen as a single-board computer that has intentionally been intended to be used by individuals who are not specialists in electronics, engineering, or programming. It is economical and compatible as it is cross-platform as it runs on Windows, Mac OS X, and Linux), and easy to program. Both Arduino hardware and software are open source and extensible. Arduino is also powerful: despite its compact size, it has about as much computing muscle as one of the original navigation computers from the Apollo program, at about 1/35,000 the price. Programmers, designers, DIY (do-it-yourself) aspirants and artists all over the world take the benefit of Arduino's influence and ease to make all sorts of pioneering devices, comprising interactive sensors.

The IOT Garbage Monitoring 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, LCD screen, Wi-Fi modem for sending data and a buzzer.

A 12V transformer powers the system. The LCD screen is used to display the status of the level of garbage collected in the bins. Whereas a web page is built to show the status to the user monitoring it. The

web page gives a graphical view of the garbage bins and highlights the garbage collected in colour in order to show the level of garbage collected. The LCD screen shows the status of the garbage level. The system puts on the buzzer when the level of garbage collected crosses the set limit.

Thus this system helps to keep the city clean by informing about the garbage levels of the bins by providing graphical image of the bins via a web page. The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi 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 preprogrammed with an AT command set firmware. The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

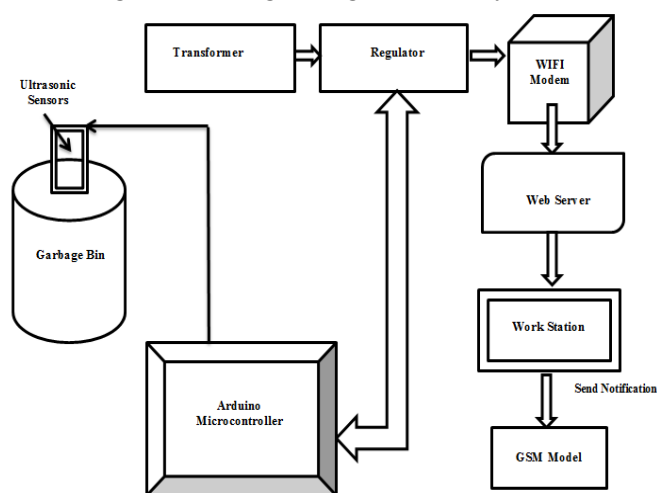


Figure 1. Smart bin- System Architecture

V. CONCLUSION

By using, the method proposed in this paper the collection of waste in the city becomes easier and tidy. It helps in dwindling air contamination, traffic flow, manpower, time period and money afforded to transport and handle the waste. With the assistance of proper technology the trucks can be guided to reach the nearest filled garbage bin for proper disposal of waste. The system projected in this paper also ensures to monitor the amount of junk inside the garbage bin so that the human efforts needed for it will be abridged and it routinely displays the level of garbage in it. Hence, it is not essential to check it manually. Likewise the air effluence that takes place due to transportation of waste from one place to another(mainly to the dump

hills) during the day-time could also be cut-off to some degree because of the indication form the sensors placed on the bins that signals the level of garbage bins if filled or in times of empty. This makes the system more economic in minimising the cost of conveyance to a broader extent. This project can enhance an edge to the cities aiming to get smart and people-friendly.

Public awareness should be created among common people to inculcate the health threats of the wastes. Littering of Municipal Solid Waste (MSW) should be banned in cities, towns and urban areas alerted by the state government. Furthermore, house-to-house collection of MSW should be systematized through methods like collection on regular pre-informed scheduling and programing.

The collection bins must be aptly designed with structures like metallic containers with lids, and to have a large and sufficient capacity to accommodate 20% more than the anticipated waste generation in the area, with a strategy for mechanical loading and un-loading, placement at suitable locations, etc. Municipal authorities should conserve the storage amenities in such a routine that they do not generate any unhygienic and unsanitary circumstances. Proper maintenance of the MSW transportation vehicles must be steered, and the dumper place should swap the old transportation vehicles. Currently, at the level of waste generation and collection, there is no source segregation of compostable waste from the other non-biodegradable and recyclable waste. Thus as a future work proper separation would lead to improved choices and openings for scientific discarding of waste and an option for proper recycling.

VI. REFERENCES

- [1]. 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.
- [2]. J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68-73.
- [3]. Md Shafiqi Islam, Maher Arebet, M.A. Hannan, Hasan Basri, "Overview For Solid Waste Bin Monitoring And Collection System", International Conference on Innovation, Management and Technology Research 2012.

- [4]. Kanika Rastogi, Akash Diwakar, Kshitij Shinghal, Aastha Gupta, Akshay Goyal, "A Review on Waste Management", International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3297: 2007 Certified Organization) Vol. 4, Issue 9, September 2016.
- [5]. Ch. Raghmani Singh, Mithra Dey, "Solid Waste Management Of Thoubal Municipality, Manipur- A Case Study", International Conference On Green Technology And Environmental Conservation (GTEC-2011).
- [6]. Vikrant Bhor, "Smart Garbage Management System", International Journal of Engineering Research & Technology (IJERT), Vol, 4 Issue 3, March-2015
- [7]. Narayan Sharma, Nirman Singha, Tanmoy Dutta, "Smart Bin Implementation for Smart Cities", International Journal of Scientific & Engineering Research, Volume 6, Issue 9, September-2015 ISSN 2229-5518.
- [8]. Emily Gertz, Patrick Di Justo, "Environmental Monitoring with Arduino" Copyright © 2012 Emily Gertz and Patrick Di Justo. ISBN: 978-1-449-31056-1, January 20, 2012
- [9]. Mufeed Sharholy, Kafeel Ahmad, Gauhar Mahmood, R.C. Trivedi, "Municipal solid waste management in Indian cities - A review", Elsevier Journal of Waste Management, Vol-28 (2008), pg no.459-467
- [10]. Ranjith Kharvel Annepu, Nickolas J. Themelis, Stanley Thompson "Sustainable Solid Waste Management in India", Columbia University, New York, January 10, 2012.
- [11]. Nils Gageik, Thilo Müller, Sergio Montenegro, "Obstacle Detection And Collision Avoidance Using Ultrasonic Distance Sensors For An Autonomous Quadrocopter", University of Würzburg, Aerospace Information Technology (Germany) Würzburg September 2012.
- [12]. Arebey, M., Hannan, M.A., Basri, H., Begum, R.A. and Abdullah, H. "Solid waste monitoring system integration based on RFID, GPS and camera" in 2010 International Conference on Intelligent and Advanced Systems, ICIAS 2010; Kuala Lumpur; 15 June 2010 through 17 June 2010.
- [13]. Jamal Othman. "Household Performances for Solid Waste Management in Malaysia." Report to EEPSEA Corpcom Services Sdn. Bhd. (www.eepsea.org), 2002
- [14]. Maher Arebey, M. A. Hannan, Hassan Basri, R. A. Begum and Huda Abdullah, "Integrated technologies for solid waste bin monitoring system" in Environ Monit Assess (2011) 177, pp.399-408.