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Survey on Smart Garbage Monitoring System Using Internet of Things (IOT)

Dr. Jittendranath Mungara¹, Shobha², Keerthana M³, Kanakambika RG³, Kokila S³

HOD, Department of ISE, New Horizon College of Engineering ,Bangalore, Karnataka, India

Senior Assistant Professor, Department of ISE, NHCE, Bangalore, India

B.E Students, Department of ISE, New Horizon College of Engineering, Bangalore, Karnataka, India

ABSTRACT: Waste management system is one of the primary problem that is faced throughout the world. The major hurdles in most of the smart cities is its solid waste management, if the waste is not disposed properly, it will cause severe diseases such as dengue, malaria etc. Although there are many organizations available for handling and managing wastes, still we are facing this major issue due to lack of co-ordination among government and local authorities. In this paper, we have survey on few of the techniques and methodologies to improve the garbage monitoring system using wireless sensors.

KEYWORDS: IOT, solid waste management, wireless sensors.

I. INTRODUCTION

Garbage Monitoring System: - Garbage may consists of the unwanted material left over from City, Public area, Society, College, home etc, due to these wastes there will be poisonous gases emitting from them which is harmful for the nearby residents which leads to severe diseases. This survey is related to the "Smart garbage monitoring system using internet of things". So for smart lifestyle, cleanliness is required. This helps us to eradicate the garbage disposal problem using Internet of Things (IOT) in which this is done using microcontrollers, transceivers for digital communication that will be able to communicate with one another [1].

One of the approach is by using ultrasonic sensors which is used to detect the level of the waste in the bin and another is by using biosensors which detects the hazardous gases. The cities will become more cleaner and the smells of the garbage will be much less and will keep our environment green and can support swachh bharat [3].

II. LITERATURE SURVEY

In city areas, the clearance of waste management is one of the challenging task throughout the world. There is a need of well organization in monitoring garbage system. Although there are many organization, still we are facing waste management system problem. Since lack of coordination among authorities and people. Therefore smart garbage monitoring system and clearance system using internet of things paper focuses on clearing the waste efficiently by using wireless sensors system and GSM/GPRS. The ultrasonic sensor detects the level of the wastes in the dustbin. Force sensor is used to estimate wastes of the dustbin. Microcontroller acts an interface between the sensors system and the GSM/GPRS system. LED lights is used to indicate if the bin is full or empty. An android application is used through which the information is received by the concerned authority or truck driver.

The hardware components such wireless sensors like ultrasonic and force and LED lights and microcontroller must be properly connected and ensure that the SIM card is placed correctly in the GSM module. And make sure that the android handset is connected to the internet [1].

As dustbin is considered as a basic need to maintain the level of cleanliness in the city, it is very important to clean all the dustbins as soon as they get filled up. We will use ultrasonic sensors for this system. The sensor will be placed on top of bin that helps in sending the information to the concerned truck driver that the level of garbage has reached its maximum level. Once the information is received, the bin should be emptied soon as possible. With this system, the

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minimal number of smart bins can be placed around the whole city and the city will still be much better. RFID is a modern and fast growing mobile technology that differently and exactly identifies a RFID tag embedded in waste bin. The disadvantages of the existing system is that the employees have to go and check the bins daily if they are filled or not, this will results in high cost. If the bin doesn't get emptied on specified time then the environment becomes unhygienic and illness could be caused and spread. The proposed system will help in removing all these disadvantages. Once driver clears the waste the PDA transfers all the data to the SQL. The back-end server is used to store and process the waste data which is transferred through WiFi (wireless fidelity) connection and the internet. Wifi isdesigned for the wireless Ethernet 802.11b standard for WLANs (wireless local area network) enhances bandwidth, making suitable for "local hot spot" service.

The present information can be gained regarding the level of the dustbin filled. It will also help in reducing the cost as the truck drivers will have to go only at that time when the bin is full. This will also help in resource optimization and once the bins are emptied at time the environment will remain safe from all kinds of diseases. The cities will become more cleaner and the smells of the garbage will be much less and will keep our environment green and can support Swachh Bharat [2].

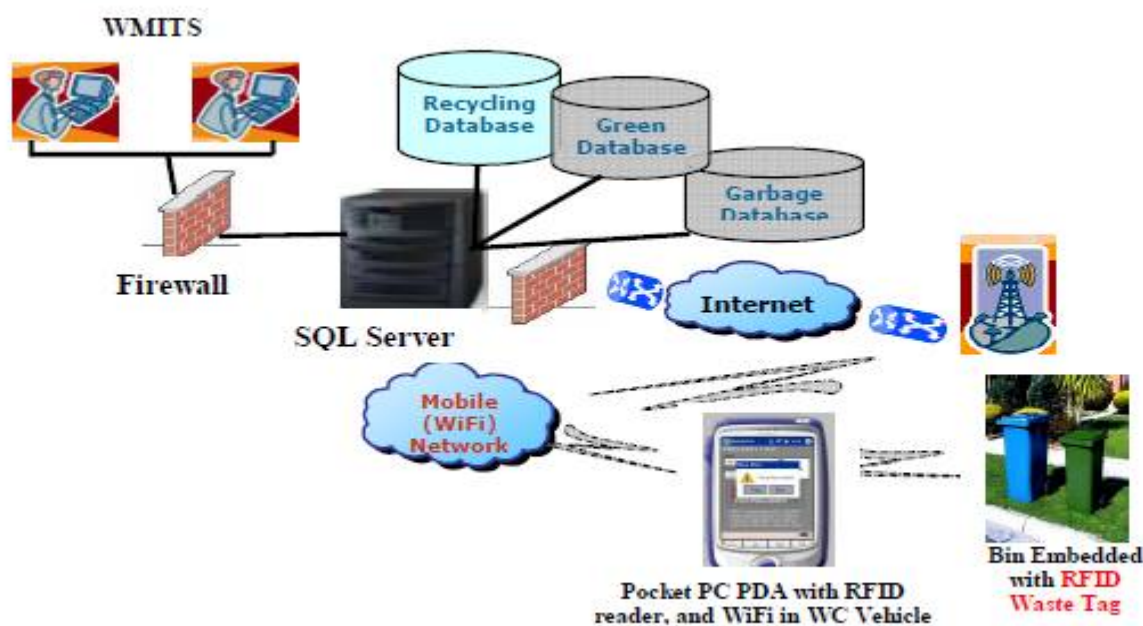


Fig.1: Components of RFID system and sensor based waste management system

Internet of things is constantly giving different solution to the problems faced by man in current day. Solid waste management is an integral part of smart city. The process of tracking, collecting, and managing could be monitored by providing complete IOT based system. One of the approach to provide solution to improve the reliability and efficiency of the system is LoRa technology. LoRa technology is used for long data communication, when compared to wifi or bluetooth. Here the sensors are used to collect the data from the dustbin and is sent to the gateway through LoRa technology. The data from gateway is collected and is stored in the cloud over the Internet using the MQTT (message queue telemeter transport). Solid waste management can be divided into segregation, collection and transportation. The working of proposed system architecture address segregation of solid waste that can be done at the initial level. Citizen can segregate the waste according to wet waste (biodegradable) and dry waste (plastic, glass, papers) and dump the garbage in the dustbin placed at different location respectively. Here the IR sensors is used to detect the level of the



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waste collected. And a gas sensors is used to detect the hazardous gases. LED lights is used for notifications. The sensors and actuator are embedded on microcontroller that collects the sensor data and sends it to the gateway through LoRa transceiver module. The gateway collects the various sensor data from garbage bin placed at different location. Here data is locally processed and these data is sent to cloud over TCP/IP using MQTT protocol. MQTT protocol collects the data and NoSQL database stores those data. Rule engines is used for analytics and display the collected data on dashboard. By google maps and suitable algorithm the trucks can be alerted to collect waste in required location. Report is generated using data analytics and admin panel the concerned authority can be monitor the entire process [3]. One of the main problem faced in today's world is waste management system, due to underlying and overflow of wastes from the dustbin result bad smell and harmful gases causes various diseases which in turn affects our green environment. To overcome the above issue a smart intelligent garbage alert system for garbage was developed. RFID (radio frequency identification) is a technique that is used for verifying and identifying the process which helps the garbage alert system by providing automatic identification of filled garbage in the bin and sends message to clear the garbage. E-monitoring performs remote monitoring to clear the wastes, therefore it reduces the manual work. An android app receives notifications through wifi/GSM.

- E-monitoring System

In traditional approach, whenever the garbage bin is filled the wastes are cleared but they are not periodically removed. Where as in convention method, there is use of RFID technology which will overcome the above mentioned issue.

- E-monitoring system consists of two parts:

1. Embedded system
2. Web based software system interface
 1. Embedded system

It comprises of RFID reader, microcontroller, liquid crystal central (LCD) and GPRS/GPSM.

2. Web based software system

It consists of GPSM, a central server, database server and webserver. The aim of this system is to develop a better monitoring system for proper municipal solid waste.

- Smart dustbin

If the wastes are not disposed properly it leads to air and soil pollution. The harmful gases and the bad smell will adversely affect human beings. To overcome this a smart dustbin was designed. The objective is to overcome improper waste management.

- Design of dustbin

The smart dustbin consists of piston, compression plate, lid of opening and leaf switch. The piston moves back and forth in vertical direction. Compression plate is used to compress the waste. Dustbin opening is closed by lid. Leaf switch could be placed upside down using hole on the plate.

- Arduino UNO

It is a microcontroller board consisting of 14 digital I/O by connecting battery task can be achieved.

- Ultrasonic sensor HC-SR04

It offers a 2cm – 400cm non-contact measurement function. It converts electrical energy into sound to send pulse.

In RFID technology the combination of antenna and microphone are attached on RFID tag it is a small device that stores and sends the data to RFID reader that receives electrical energy after getting transformed from radio frequency.

- System implementation

The system is designed to avoid the overflowing of wastes from dustbin by transmitting the alerts to microcontroller. it uses RFID technology to identify and verify process. The function of each parts of the system are enunciated earlier.

The block diagram is shown below

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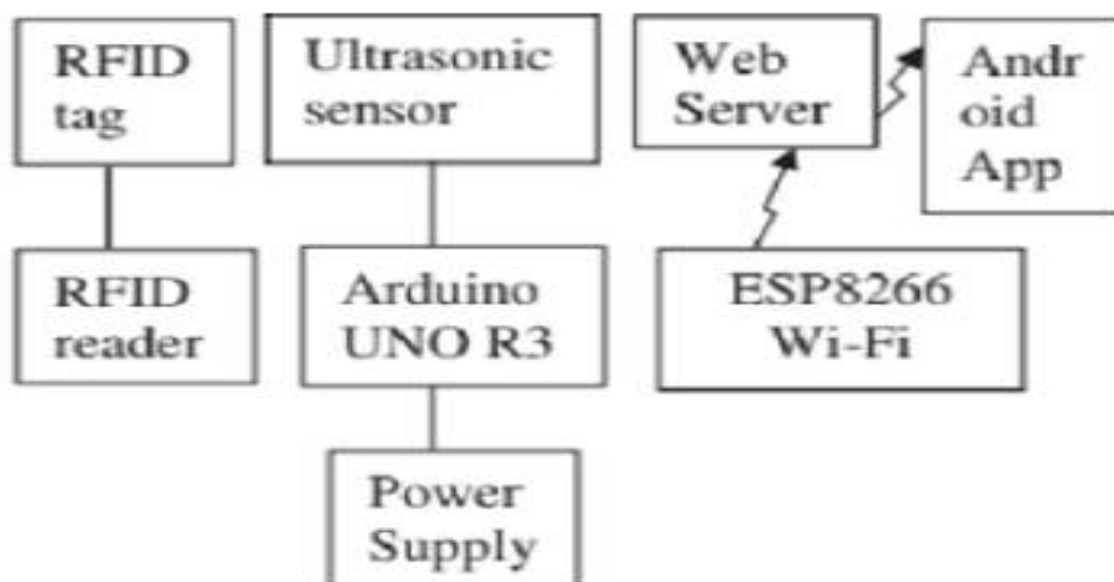


Fig.2: Block diagram of garbage alert system

The alert system is used for maintenance in the garbage system. When this is deployed a green environment and pollution free can be achieved. It also decreases the manual work in municipality and pollution monitoring system [5]. For a healthy environment we need to monitor and clear the garbage waste regularly to stay healthy. In the old system where people are hired to check and empty the filled bins has led to human error and neglect. In today's life people scarcely have time to stop and record things manually, even though critical things like cleanliness gets ignored. And also we have put forward the concept of network of smart garbage bin which is based on Stack Based front End approach with the cloud computing and know how Machine Learning techniques like Decision Forest Regression can be applied to the sensor data layered by the system to gain useful data/information to improve the efficiency of the garbage monitoring so as to save fuel and time and make the whole process in an efficient and convenient. The workers who go on a routine/regular check should know the shortest route [6].

III. PROPOSED SYSTEM

Garbage is a waste generated due to the various activities, such as industry waste, wet waste like vegetable waste, dry waste, commercial waste, house hold wastes etc. Improper utilization of the garbage may pose several environment issues namely generation of various hazardous gases which leads to the various health issues. While carrying the garbage, it must be carried and disposed by following various types of protocols. The processing of garbage involves the carrying the garbage from one place to other through trucks and cranes. But while carrying the gases, the people who is responsible to collect the waste must follow some of the rules and regulations. So that it should not affect the people of the society and our green environment. But at the time of processing in the cities is important. Because, in current days the garbage collection is not been collected properly due to lack of coordination among authorities, specialized vehicles and other means. So, the garbage which is on the road or land is degrading itself and emits a bad smell and also poisonous gases. Because in the garbage collectors, it's not cleaned properly and causes the different diseases like cholera, skin diseases etc. The proper utilization of garbage can help us to get some gases. Some may harm and some are useful. The useful gases which are emitting from the garbage can be utilized for commercial purpose also.

The gases which are emitting from the garbage can cause various diseases and harm the environment. So to know what is the concentration of the garbage in various places and in the main container, this is designed and implemented in



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various places and tested. Earlier, people of the society and the concerned authorities used to know that some sort of gases are emitting from the garbage. But they don't know the exact values which are emitting from the garbage. Also they are not getting any data. The people of the society must inform for the concerned officials back to back once the garbage is collected. To address the problem here about detection of various hazardous gases which are emitting from garbage causes diseases like asthma, cholera, typhoid, malaria etc. The gases which are emitting from the garbage should be monitored. A hardware or any other means must be installed in the place of garbage. The sensors are going to deploy in the garbage. The sensors must be low cost, less power consumption sensors. With those sensors, sense the gases which are emitting from the garbage and send the same information and it must be stored in the public cloud. Also information must be displayed in the web side accordingly. An SMS has to be sent to the authorized person.

IV. CONCLUSION AND FUTURE WORK

In the entire world, waste management is a major challenging one. If it is not properly disposed or cleaned which will cause severe diseases and spoil the green environment. There is need of new mechanism to properly dispose the waste [5]. Here a working prototype of the proposed system was successfully created and implemented using technologies. An embedded alert system is used for the proper monitoring and maintenance of the garbage bin. This system alerts for regular clearance of garbage dumped. Thus this system can provide solution for disease free country and green environment. In this paper we have described multi-layer waste management system architecture for design of a RFID; sensor based real-time automatic WIWSBIS. We have shown the application and implementation of smart garbage monitoring system. Using WIWSBIS, waste management service providers (e.g., municipalities, waste collectors) have a chance to track a waste identity (i.e., customer), weight, missing/stolen bins quickly and accurately without human intervention. This system also helps service providers to automate customer invoices, enhance cost savings and improve security[3]. In this present world, waste management is becoming a challenging task. If it is not properly dispose or cleaned which will causes lot of diseases and spoil the green environment. There is need of new mechanism to properly dispose the waste. Sensors have been used to indicate if the bins are filled or empty. When the bins are filled the truck driver receives a message to clean the bin. So an android application is developed through which the user can find a bin near him to throw the trash. This creates a direct connection where every citizen is doing his part in maintain a clean environment around him[1]. And also by using solar panels we can conserve energy.

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