Smart Waste Management Using IOT Powered Dustbin

Prof. N.D Sonawane[1], Mandhare Gulab M.[2], Dixit Shweta P.[3], Londhe Sonali P.[4], Todkar Priyanka D.[5]
[1]*Assistant professor Dept. of Computer Science PDEA'S COEM*
[2,3,4,5] *Student Dept. of Computer Science PDEA'S COEM*

***Abstract*- The 21st century is the era of technological development. Estimation by Cisco says that more than 50 billion devices will be connected to the internet in the 21st Century. To make the cities greener, safer, and more efficient, Internet of Things (IoT) can play an important role. Improvement in safety and quality of life can be achieved by connecting devices, vehicles and infrastructure all around in a city. System integrators, network operators and technology providers have a role to play in working with governments to enable smart solutions. But, building such solutions on an open, standards-based communications platform that can be continuously used is a challenge. We present a waste collection management solution based on providing intelligence to waste bins, using an IoT prototype with sensors. Things would become "SMART" and influence the lives of humans. It can read, collect, and transmit huge volume of data over the Internet. With technological advancement in urbanization, industrialization and population governments across the global will need to device sustainable development plans. In recent years the notion of Smart City has been trending across the global and government is investing huge sums of money towards establishing smarter cities. A Smart Waste Management System makes a smart city complete. In this project we are going to use a range of smart sensors for detecting various data required for converting a normal dustbin into a smart dustbin. The large amount of data collected can be used to gain insights of the waste generated by any area.**

***Index terms*- IOT, NodeMCU, RTC, Ultrasonic Sensor, wi-fi, power supply, Load sensor, solar panel**

1. INTRODUCTION

As the population is increasing the solid waste is also increasing in urban and rural areas and waste management has become a global concern. We need to take right decision in order to manage this overflowing garbage. Mainly there are three types of sources where garbage is generated viz. residential, commercial and industrial. The garbage produced in the residential area can be collected directly from home or by making an arrangement for mass collection in that area and can be lifted using vehicles. In case of restaurants, malls and other commercial establishment garbage can be collected directly from the unit using vehicles. Industrial garbage which includes waste produced in construction sites, various industries can also be disposed using different ways. For effective handling of these wastes like collection and disposal, Internet of Things (IOT) concept is being used, which mainly deals with sensing, actuating, data gathering, storing and processing by connecting physical and virtual devices to the Internet. The lifestyle of the people changes which has caused an increase in the levels of waste generation. Serious challenges are posed due to this. The waste management schemes at present are not enough to handle the ever-increasing levels of waste. Inefficient waste management techniques have given rise to the possibility of such kinds of problems. The traditional waste management system, cleaners are assigned to empty the waste bins at a particular time of the day. Such a strategy has a lot of disadvantages. The system is inefficient as the cleaners are not aware of the garbage collected in the dustbins before reaching at the actual spot. Sometime it may happen that the garbage in the dustbin is full or sometimes it may be not up to the level where it needs to be emptied. Hence it reduces the efficiency of the system. To overcome this problem and to make the Waste management system efficient we have developed a Smart Dustbin concept. The smart dustbin uses a NodeMCU as the micro controller. An ultrasonic sensor is used in order to detect the level of garbage filled in the dustbin. An RTC module is used for registering time stamp. All this data is sent to an Android app which has an in built QR Scanner for ensuring Garbage Collection and Disposal.

2. PROPOSED METHODOLOGY

1. This project uses NodeMCU as the microcontroller. It has various sensors for monitoring the dustbin.
2. An Ultrasonic Sensor is used to determine the level of garbage in the dustbin It determine current status of the dustbin.
3. An RTC is used in order to keep a note of the time at which the dustbin was last cleared.
4. The device would be powered by USB charger as well as it can be operated using solar power.
5. The android app for the Smart Dustbin will have data such as garbage level, last cleared time and battery level of the device.
6. The android app will be developed on MIT App Inventor 2.

3. LITERATURE SURVEY

The literature surveyed some different papers to get information about the existing work which have been done SauroLonghi,DavideMarzioni, EmanueleAlidor, Gianluca Di Bu`o, Mario Prist, Massimo Grisostomi and MatteoPirro. proposed, garbage collector supported by using sensor motes which is providing information and status about the bin and also sending the retrieved data through DTN (Data Transfer Nodes). This bin has a custom prototype instead of basic installation of sensor nodes. The whole system is designed For allowing heterogeneous sensor for communication. A wireless sensor network is helped for controlling bin by gathering data from motes. The limitation here is that the information about the bin is not directly transferred to the server or to the client; it needs to be sent through the Data Transfer Nodes. Shubham Thakkar, R.Narayanamoorthi, in this paper using the Near Infrared Reflectance (NIR) spectroscopy we can identify the type of plastic. The alienated dissipate equipment from MSW (municipal solid waste) can be place in a needy area. By Using a dissenter material which can be mix into a uniform material. The entire process is repeated every hour. The fermentation mechanism took place in a sealed atmosphere, where bacteria converted into undividable enzymes which results in biogas Andrei Borozdukhin, Olga Dolinina and Vitaly Pechenkin, this proposed system consists of two parts: software and special signalling equipment. The equipment is placed on the side walls of the bin which consists of two parts: one is the receiver-transmitter and sensor. Sensor is used to indicate the level of the bin which is connected to the transmitter that transmits a signal of fullness of the bin to the receiver at the server host. A manager is appointed at the server side whose job is to find the shortest route and intimate it to the truck driver to collect it in a short interval of time. Thompson A.F, Afolayan A.H, Ibidunmoye E.O projected work about the internet-based platform for the organization and monitoring of waste collection, discarding and carrying etc. This is comprised of the client, server and storage. The client is the device which can access the pages and forms used by web application e.g. PDAs, phones, laptops etc. the desktop is a program that launches the application and makes it performs over the internet. In this, the back-end system is the web server and database management system that supervise the data used by the function to monitor the movement of data between user and system. The limitation of this paper is that it only shows the location of the bin in the web page.

AIMS AND OBJECTIVES:

1. Garbage level detection
2. Display Battery status in android app.
3. Display time stamp when garbage was lastly cleans.

4. RELATED WORK

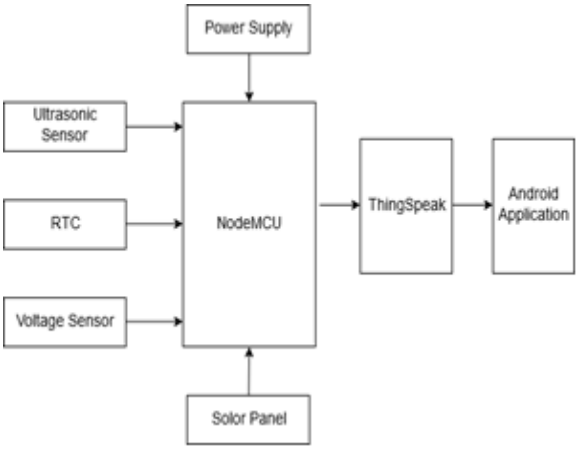

Fig 4.1 Architecture of smart dustbin

We propose a smart waste collection system on the basis of level of wastes present in the waste bins. The data obtained through sensors is transmitted over the Internet to a server for storage and processing mechanisms. It is used for monitoring the daily selection of waste bins, based on which the routes to

pick several of the waste bins from different locations are decided. Every day, the workers receive the updated optimized routes in their navigational devices. The significant feature of this system is that it is designed to update from the previous experience and decide not only on the daily waste level status but also the predict future state with respect to factors like traffic congestion in an area where the waste bins are placed, cost-efficiency balance, and other factors that is difficult for humans to observe and analyses. Based on this historical data the rate at which waste bins gets filled is easily analyzed. As a result, it can be predicted before the overflow of wastes occurs in the waste bins that are placed in a specific location. Depending on economic requirements specified at early stages, the optimized selection of waste bins to be collected is expected to improve collection efficiency. shows the system overview, whose components are briefed as follows

- Ultrasonic Sensors: We can determine the waste level by measuring the distance from the top of the trashing to the waste by sonar.
- Real time clock (RTC): RTC is used for updating time and dates. It displays the data on android application.
- Voltage sensor: voltage sensor used to determine, monitor and can measure the supply of voltage.
- Solar panel: A solar panel is design to absorb the sun rays as source of energy for generating electricity. In case if power supply doesn't work then solar panel is used.
- NodeMCU: It is open source iot platform. The term nodemcu by default refers to firmware rather than development kit.
- Power supply: It provides electricity supply.
- Android App: It provides current information of date and time related to cleaning of garbage.

5. PROPOSED SYSTEM

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

6. SYSTEM ARCHITECTURE

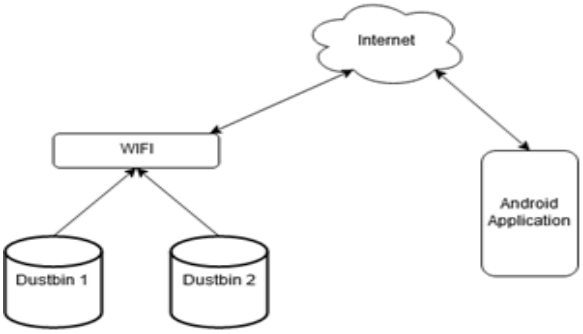

Fig 6.1 Working of the system

7. CONCLUSION

We presented an intelligent waste collection system. The system is based on IoT sensing prototype. It is responsible for measuring the waste level in the waste bins and later send this data (through Internet) to a server for storage and processing. This data helps to compute the optimized collection routes for the workers. Through this paper we want to propose a technological process for managing waste. By making use of the sensors given above we can implement a smart dustbin. The system can collect accurate data in real time which can be used further. The smart dustbin prototype can be used in any conventional dustbin and make the Waste Management easier and efficient.

REFERENCES

[1] Arkady Zaslavsky, kostas Kolomvatsos, Alexey Medvedev, Pouria Amirian, Jeremy Morley, Stathes Hadjieftymiades" Challenges and opportunities of Waste Management in IOT-enabled Smart cities: A survey" an IEEE Transaction 2017.

[2] Krishna Nirde, Prashant S.Mulay, Uttam M.Chaskar" IOT based solid waste management system for smart cities" an ICICCS in 2017.

[3] Dr.N.Sathish Kumar, B.Vijayalakshmi, R.Jenifer Prathana, A.Shankar", IOT based smart garbage alert system using Arduino Uno" an IEEE in 2016.

[4] Andrei Borozdukhin, Olga Dolinina and VitalyPechnkin, "Approach to the garbage collection in the Smart clean city Project", in

Yuri Gagarin State Technical University of Saratov,Russia in 2016.

[5] Kanchan Mahajan, Prof.J.S.Chitode," Waste bin monitoring system using integrated technologies" an IRJET in july 2014.

[6] Prof.R.M.Sahu, Akshay Godase, Pramode shinde, Reshma Shinde," Garbage and street light monitoring system using IOT" an IRJET in April 2016.

[7] BelalChowdhury,Morshed Chowdhury,"RFID based Real-time Smart waste management system", an Australasian telecommunication networks and application conference in 2017.