A Survey on Smart Waste Management

Jyoti Sakhare[1], Prof. L. M. Deshpande[2]
[1]Dept of Electronics and Telecommunication Engineering
[2]Professor, Dept of Electronics and Telecommunication Engineering
[1, 2] TPCT'S College of Engineering, Osmanabad, Maharashtra, India

Abstract- *In present condition of our world waste management is a major concern in the metropolitan cities of the developing and developed countries. As the population is growing, the garbage is also increasing day by day. Garbage management is becoming a global problem. Due to the lack of care and attention by the authorities the garbage bins are mostly seem to be overflowing. It has to be taken into care by corresponding authorities and should think what method can be followed to overcome this. This huge unmanaged accumulation of garbage is polluting the environment, spoiling the beauty of the area and also leading to the health hazard. To overcome this situation an efficient smart waste management system has to be developed. In this era of Internet, Internet of Things (IOT) can be used effectively to manage this waste as many effective methods can be found out easily. This is the survey paper which involves the various ideas to solve this problem using some algorithms that can be easily implemented.*

Keywords- Raspberry Pi, Ultrasonic Sensor, ESP8266, Load Sensor, Humidity Sensor

I. INTRODUCTION

Things that are connected to Internet and sometimes these devices can be controlled from the internet is commonly called as Internet of Things. The Internet of Things (IoT) is a concept in which surrounding objects are connected through wired and wireless networks without user intervention. In the field of IoT, the objects communicate and exchange information to provide advanced intelligent services for users.
In our system, the Smart dust bins are connected to the internet to get the real time information of the smart dustbins. In the recent years, there was a rapid growth in population which leads to move waste disposal. Managing the smart bins by monitoring the status of it and accordingly taking the decision. This waste is further picked up by the municipal corporations to finally dump it in dumping areas and landfills. But due to lack of resources, ineffective groundwork, some waste is not collected which poses serious health hazard to the surrounding environment. Proper cleaning intervals may provide a solution to this problem. But keeping a track of the status of the bin manually is very difficult job. There are multiple dustbins are located throughout the city or the Campus in our system, the Smart dustbins are connected to the internet to get the real time information of the smart dustbins. These dustbins are interfaced with raspberry pi based system with ultrasonic sensors. Where the ultrasonic sensor detects the level of the dust in dustbin and sends the signals to raspberry pi the same signal encoded and send to the application and it is received.

The data has been received, analyzed and processed in the database, which displays the status of the Garbage in the dustbin on the application of authoritized person mobile. The concerned authority get alert about dustbin is full and informs person whoever is responsible for collecting garbage from the particular areas. The garbage trucks collect the garbage from the completely full dustbin and dispose it.

II. LITERATURE SURVEY

The waste management in cities should be effectively and efficiently implemented. The various proposals were put forward and some of them are already implemented. But we cannot consider it as an effective one. So a survey was done among different proposals and this survey paper includes survey among different methods for smart waste management in cities using IoT. This section discusses about the existing approaches in the field of smart waste management.

Maya Chavan [1], has done survey on Muncipal waste management in which details regarding diffrenent methods of waste collection has been collected. Also to find out the effective methods which are useful to provide hygiene environment to citites.

S.A. Mahajan [2] has suggested a model for real-time monitoring the garbage level of respective garbage bins and to detect the level when threshold value is reached using combination of Sensors and Raspberry pi and wireless communication will reduce the total number of trips required of GCV and thus, will reduce the total expenditure associated with the garbage collection.

Zainal Hisham Che Soh[3] has suggested new solution to enhance waste collection efficiently using the Arduino Uno with Arduino Ethernet Shield technology and

ultrasonic sensor systems. In this proposed system, the garbage overflow of garbage can be avoided and managed efficiently. This will intimate or send SMS or email to the authorized person through Ubidots platform.

Parkash Tambare[4] has suggested a system that information of all smart dustbins can be accessed from anywhere and anytime by the concern person and he/she can take a decision accordingly. By implementing this proposed system the cost reduction, resource optimization, effective usage of smart dustbins can be done. This system indirectly reducing traffic in the city.

Amrutha P.V. [5] has suggested implementation of smart garbage Bin indicator receptacle, gives a solution for unsanitary environmental condition in a city. The implementation of Smart Garbage collection bin using internet, IR sensor, and raspberry pi. The system assures to send mail notification and status on dashboard of dustbins 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.

Pavan Kumar [6] has suggested method the collection of waste in the city becomes easier. It helps in reducing air pollution, traffic flow, man power, time and money. With the help of proper technology (GPS & SOFTWARE APPLICATIONS) we can guide the trucks in selecting the shortest path for garbage collection. The project can add an edge to the cities aiming to get smart and people-friendly.
Kusum Lata[7] has suggested the Smart waste management system that identifies fullness of the bin using a wireless sensor network (WSN) and embedded Linux board and inform the authorized person for the cleaning of the bin.

Ms. Rupa[8] has suggested smart garbage management system based on IOT for urban areas acts as one of the innovative system to keep the cities clean. The system monitors the dustbins in different areas and update about their status on a website. For this, the system uses ultra sonic sensor placed over the bins to detect the garbage level, Advanced Virtual Reduced (AVR) instruction set microcontroller ATmega16 for controlling the whole system working, Global system for mobile communication (GSM) to send message to higher authority, GPRS (General Purpose Radio Service) for updating status on designed website. The website designed for this purpose gives a tabular view of the status of dustbin along with date and time and the 16X2 LCD display equipped with system will show the changing status of dustbin.

Rishabh Kumar Singhvi [9] has suggested Smart system provides the filling status of dustbin using message and it will save time, fuel and money of Municipal Corporation. As there was a problem of checking real time status of dustbin so it will be cleaned timely. So, in this project this problem is solved and proper database is managed online.

Sapna Suryawanshi[10] has suggested providing the services for the different kind of stake holders involved in this area.On-board surveillance cameras and reporting system. Development of application for city administration.

Kellow Pardini[11] has surveyed on IoT based Solid waste management solutions.In which different types of waste are highlighted. An in-depth review of state-of-the-art on solid waste management Presentation of architecture models for solid waste management identified in the literature based on IoT requirements emptying requirements, such as distances and type of waste

III. SYSTEM ARCHITECTURE

In this section, a brief explanation regarding on the project development and methodology will be described. This project proposed a system to control a waste material from overflow from the waste bin and alert is send to cleaner for waste collection. Using the anticipated system, monitoring of the waste collection status could be monitored effectively. This project designates a technique in which could monitor the garbage level at regular intervals as overflow of the bin can be prevented. The filling level of the garbage in the dustbin and its original level height could be sensed/ monitored by the ultrasonic sensor.

Referring to the block diagram in Figure 1 below, the developed system consists of a 1) sensor node that implemented using Microcontroller which will be Raspberry Pi 3 ,ultrasonic sensor, load sensor;

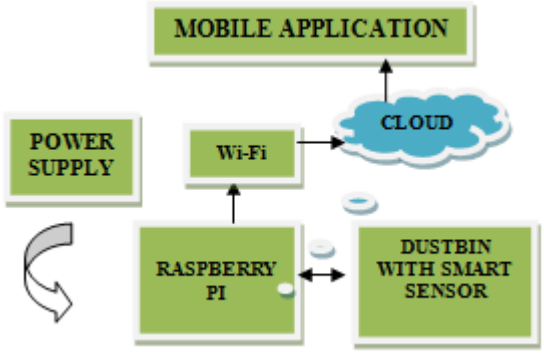

Fig – Architecture

This proposed architecture will have configuration of Master Slave dustbins. Which would overcome the issues in related to connectivity remote areas. Each master dustbin shall be equipped with a micro-controller. Each of the dustbins has 3 types of sensors:

1) Level sensor: It will provide continuous information of level of dustbin filled to the server. When the waste in dustbin reaches to its threshold level, an alert message goes to the server through cloud.
2) Humidity sensor: This sensor gives the information of humidity present in the waste.
3) Load cell: This sensor gives the information related to the weight of waste present in dustbin.
4) On checking these parameters time to time the performance rate will increases. This system will lead to have a clean city, clean country, approximately clean world.

IV. HARDWARE DESCRIPTION

4.1Ultrasonic sensor:

As the name indicates, ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception.

Fig. 4.1: HC-SR04 Ultrasonic Sensor

4.2Humidity Sensor:

A humidity sensor (or hygrometer) senses, measures and reports both moisture and air temperature. The ratio of moisture in the air to the highest amount of moisture at a particular air temperature is called relative humidity. Relative humidity becomes an important factor when looking for comfort.

Fig.4.2: DHT22 Humidity Sensor

4.3Load Cell:

A load cell is a sensor or a transducer that converts a load or force acting on it into an electronic signal. This electronic signal can be a voltage change, current change or frequency change depending on the type of load cell and circuitry used.

4.4Raspberry Pi:

Raspberry Pi 4 Model B was released in June 2019[23] with a 1.5 GHz 64-bit quad core ARM Cortex-A72 processor, on-board 802.11ac Wi-Fi, Bluetooth 5, full gigabit Ethernet (throughput not limited), two USB 2.0 ports, two USB 3.0 ports, and dual monitor support (4K resolution). The Pi 4 is also powered via a USB-C port, enabling additional power to be provided to downstream peripherals, when used with an appropriate PSU.

Fig 4.4: Raspberry Pi 4 Model B.

V. METHODOLOGY OF SYSTEM IMPLEMENTATION

In this paper, master slave dustbins are configured. The main system is present in master dustbin and the sensor with Iot infrastructure is present in slave dustbin. The communication between these dustbins will take place through Raspberry Pi 4 module. The work of raspberry pi is to collect the information from the sensors and according to the information the message should be send to the server within the time limit.

According to the information the concerned authorities will send the message to the nearest waste collection in charge. So, that waste will be collected within the time period. This system will reduce the consumption of time.

VI. CONCLUSION

This survey has been performed for collecting the details of smart waste management methods and to find out effective methods which are useful for providing hygiene environment in cities. Our solution is based on the idea of IoT

infrastructure, which should provide enough information to handle this Smart City issue more efficiently

REFERENCES

[1] Maya Chavan1, T.R. Pattanshetti2 Survey on Municipal Waste Collection Management in Smart City International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 05 Issue: 01 | Jan-2018.

[2] Prof. S.A. Mahajan, Akshay Kokane, Apoorva Shewale, Mrunaya Shinde , Shivani Ingale, Smart Waste Management System using IoT International Journal of Advanced Engineering Research and Science (IJAERS) [Vol-4, Issue-4, Apr- 2017].

[3] Zainal Hisham Che Soh1 Mohamad Azeer Al-Hami Husa2 Syahrul Afzal Che Abdullah3 Mohd Affandi Shafie4 Smart Waste Collection Monitoring and Alert System via IoT

[4] Parkash Tambare Prabu Venkatachalam IoT Based Waste Management for Smart City International Journal of Innovative Research in Computer and Communication Engineering • February 2016.

[5] MS. AMRUTHA P.V. MS. CHAITHAR B.N. MS. KAVYASHREE D.R. MS. POOJA S. KUMAR IOT BASED WASTE MANAGEMENT USING SMART DUSTBIN PROJECT REFERENCE NO.: 40S_BE_2142.

[6] MR. PAVAN KUMAR MR. RAGHAVENDRA SINGH BHADAURAI MR. PRASHANT HONGEKAR MR. VIVIEK KUMAR SMART WASTE MANAGEMENT SYSTEM PROJECT REFERENCE NO.: 39S_BE_0321.

[7] Kusum Lata1, Shri S. K. Singh2 IOT BASED SMART WASTE MANAGEMENT SYSTEM USING WIRELESS SENSOR NETWORK AND EMBEDDED LINUX BOARD International Journal of Current Trends in Engineering & Research (IJCTER) Volume 2 Issue 7, July 2016 pp. 210 – 214.

[8] Ms. Rupa1, Ms. Rajni Kumari2, Ms.Nisha Bhagchandani3 Mr. Ashish Mathur4 Smart Garbage Management System Using Internet of Things (IOT) For Urban Areas IOSR Journal of Engineering (IOSRJEN) www.iosrjen.org ISSN (e): 2250-3021, ISSN (p): 2278-8719 Vol. 08, Issue 5 (May. 2018), ||VI|| PP 78-84.

[9] Rishabh Kumar Singhvi*, Roshan Lal Lohar*, Ashok Kumar*, Ranjeet Sharma*, Lakhan Dev Sharma*, Ritesh Kumar Saraswat* IoT BasedSmart Waste Management System: India prospective.

[10] Sapna Suryawanshi1, Rohini Bhuse2, Megha Gite3, Dhanashri Hande4 Waste Management System Based On IoT International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 05 Issue: 03 | Mar-2018.

[11] Kellow Pardini 1, Joel J. P. C. Rodrigues 1, 2, 3,*, Sergei A. Kozlov 3, Neeraj Kumar 4 and Vasco Furtado 5 IoT-Based Solid Waste Management Solutions:A Survey.

[12] Pramodhini. R Manjunatha B Pradeep Kumar P C Manoraj R Smart Bin Monitoring System using IOT IJSTE - International Journal of Science Technology & Engineering | Volume 4 | Issue 12 | June 2018.