A Smart Waste Monitoring System Using IOT

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Abstract—With an increase in the population, the assumption of neatness and cleanness with respect to waste management is corrupting enormously. The excess wastes in public places create unhygienic circumstances in the surrounding regions. It may lead to several disorders among the people staying in that particular region. It also defines the grade of that area how well the waste is managed. We, the people should take some initiative to make our environment green and clean along with technological support. The level of waste in bins can be detected by using some sensors, location can be fetched easily through some GPS modules. Currently, involved department workers are checking the level of garbage containers with large vehicles that consumes a lot of work and fuel. To avoid and to overcome these issues, a smart solution is needed that can be provided using the Internet of Things (IoT). This paper goes through various smart ways to solve existing issues using IoT.

Index Terms— garbage, dustbins, GSM, GPRS, IoT, IR.

I. INTRODUCTION

Nowadays, waste management is a major challenge in developed cities for most of the countries around the world. An efficient and operative waste monitoring is essential to maintain a clean and safe environment. Whenever waste disposals increase, there is a chance of an increase in health disorders. Cleaning and maintaining waste is one of the toughest tasks in urban areas where the population count is more. An efficient and well-organized waste collection system is required to keep the environment clean and green. Waste recycling is one of the useful technology which is maintained well. In urban areas, environmental protection plays an important role where its demand is high and it has become the competitive framework for waste management. Many available embedded systems having different designs and patterns according to the requirements, utilities, and functions. In this paper, the systems we are discussing is mainly composed of IoT devices like GPS, GPRS and some sensors like an ultrasonic sensor, etc.

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II. RELATED WORKS

[1] IoT based Waste Collection System using Infrared Sensors, in this paper author proposes a system which contains infrared obstacle line sensors for garbage identification which will be connected to raspberry pi 2 board. Board is equipped with Wi-Fi card/Global System for Mobile (GSM) module that connects to internet. When the dustbin fills up, the board that informs python based web application system which is responsible for handling notification from dustbins and it provides optimized routes and collection plans. The proposed system is cost effective as Raspberry pi board is cheap, as infrared sensors are used it has faster response time than ultrasonic sensors.

[2] IoT Based Smart Garbage alert system using Arduino UNO, in this paper author proposes a smart system to inform the level of garbage accumulated in dustbins. This system uses an ultrasonic sensor to check the level of trash inside the bin with the help of Arduino UNO. The municipal web servers are notified to clear the trash in the bins once it is filled up. Radio Frequency Identification (RFID) helps in verification and also helps in communicating server. Verification takes place based on the level of filling the waste in the bins. To avoid manual methods, an android application is also implemented for monitoring the cleaning process. By using a wifi module, notifications are sent to an application.

[3] Smart Garbage Monitoring and Clearance System using Internet of Things, in this paper authors proposes a smart waste management system using IoT where in system checks the dustbin levels with sensors and communicates the concerned authority about its status with the help of GSM/General Packet Radio Service (GPRS). A microcontroller is used as an interface between sensors and GSM/GPRS. An android application is developed to inform people to identify nearest empty dustbins so that people can sustain cleanliness in environment .This project can be increased further by making it compact and having separate dustbins for dry and wet wastes so that wet waste can transformed to biogas.

[4] Smart Waste Management using Internet-of-Things, in this paper authors proposes a model which obtains waste levels in waste bins with the help of sensors by measuring distance from top of trash bin and it transfers the data to server for storing and further processing using Wi-Fi. With the help of Artificial Intelligence (AI) even prediction of waste levels are calculated based on excessive traffic congestion and by using optimization algorithms shortest path for waste collection informed to cleaners in a understandable format. Global Positioning

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System (GPS) is also made utilized to search better routes. This system can be improved for various types of wastes.

[5] Internet of Bins Trash Management in India in this paper author proposes an garbage management system which uses weight sensors and infrared sensors for garbage identification. A micro controller is connected to IR sensor for transmission of data. GSM is used to communicate the information with truck drivers. In this system two thresholds are fix once a first limit is reached a message is sent to truck driver and waits for acknowledgement if it is not received back it sends again when the next limit is reached. Trash can closes its lid to prevent further dumping of garbage. If the trash is not cleaned even after some time the alert is sent to higher authority for further action. With all these facilities it gives clean environment.

III. METHODOLOGY

Smart Waste Management using IoT:

In many countries, waste management has become a great challenge. An efficient and operative waste management is required to safeguard the green environment that should decrease the waste disposal in the current days. In many smart cities, the main challenging work is to clear the waste disposals from time to time. Many organizations have developed many applications to control waste management effectively. Today's technology is helping out to come over this issue of waste management, mainly Internet of Things that contributing more to society. To control and monitor the waste in bins we are using ultrasonic sensors and force sensors. The quantity of waste in bins is calculated by the ultrasonic sensor and the weight of the bin is calculated by a force sensor. To identify whether the bin is filled or not, red and green LEDs are implemented. When the bin is filled, it sends the information to the authorized person or to an authorized department with GPS location of the bin located through GPRS directly with Amazon cloud web server.

The system architecture consists of a microcontroller unit, Ultrasonic sensor, force sensor, GPRS GPS, LCD, Amazon cloud web server and Amazon app. In this system, the ultrasonic sensor helps to identify the level of waste in the bins as it reads the distance. The nearest authorized department will be receiving the information when the bin is filled and amazon device helps to read the information from the server where the bin is located using a GPS system. Then the information is sent to the nearest vehicle to collect the waste from the respective bin. Here, a microcontroller is required to interface the sensors with the GPS system.
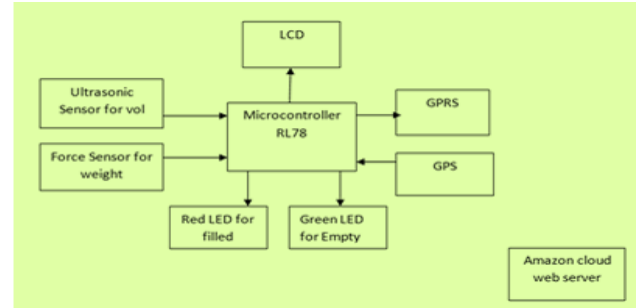

Figure 1: System Architecture

This working system is going to eliminate the present status about the bins which are laying most of the time in a position regarding full of garbage without being cleaned from time to time. We have also implemented an android application that helps the user to find the nearest bin to throw the waste. This system creates a clean and green environment where every citizen is directly interacting and doing his job perfectly. As discussed earlier, municipality officers will be informed about bins within their surrounding by web servers

Table 1: Comparison of technologies used

SL NO	Technology	Advantages	Disadvantages
1	Raspberry Pi	Cheap, Small size	Cannon run on x86 OS
2	Ultrasonic Sensors	Senses all materials, higher sensing distance	Temperature sensitive
3	Android	Open Source	Prone to virus, battery drains
4	RFID	Easy Installation, High security	Costly, Shorter coverage range
5	Infrared Sensors	Faster response, secured communication	Lower transmission rate, affected by hard objects like wall

IV. CONCLUSION

In this entire world, waste management is a major challenging issue that plays a very important role in the development of the nation. If it is not properly disposed or cleaned which will causes lot of diseases and spoil the green environment. Using IoT there are different and efficient solutions for waste management with minimum human attention. In this paper we have addressed and came across the various techniques of waste management. We have considered solutions for checking status of trash cans, sending information to respective person by giving shortest way to collect it.

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