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A STUDY ON SMART WASTE MANAGEMENT USING INTERNET OF THINGS (IoT)

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ABSTRACT

With growing population amount of waste production is increasing.The garbage bins located at public places overflows well before it is cleaned which leads to bad smell, ugliness and causes diseases to people in that locality.

To avoid all these things garbage has to be managed in a proper way for which garbage bins have to be monitored and cleaned on a regular basis.Currently concerned department workers are checking the level of garbage containers with large vehicles which consumes lot of fuel and work.

To overcome these issues a smart solution is required which can be provided using Internet of Things.This paper goes through various smart ways to solve the existing problems using IoT.

Keywords— IoT, GSM, RFID, GPRS

INTRODUCTION

Age of the earth is approximately 4.5 billion years in which the known human history is hardly few thousand years old.Transformation of cave man to civilized man has taken thousands of years and the evolution of science and technology accelerated the process of human advancement in every field.The world has become a global village and the population explosion is demanding more and more from science and technology for its proper management with all state of the art facilities.There is massive migration from rural to urban areas in search of jobs and better facilities.This sudden rush towards cities is making the administrative authorities to find new ways to provide facilities for all.As the needs of the people are increasing it is resulting in eruption of more problems in satisfying those needs which is demanding intervention of technical expertise to monitor and fulfill the needs of the citizens.This is where the need of Internet of Things(IoT) comes into picture.

IoT is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

A thing, in the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an IP address and provided with the ability to transfer data over a network.

IoT has evolved from the convergence of wireless technologies, micro-electromechanical systems (MEMS), micro services and the internet.

This can be used in transport, security, utility, etc. This in turn has given raise to the concept of smart waste management where technical and scientific knowledge is being applied to understand, plan, execute and monitor the needs of all.

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 detection which will be connected to raspberry pi 2 board.Board is equipped with Wifi card/Global System for Mobile(GSM) module which connects to inter-

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net.When the dustbin fills up board 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 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 alert system to inform the level of garbage accumulated in dustbins.The system alerts the municipal web servers to clean the garbage with proper verification based on level of filling.This system uses ultrasonic sensors with Arduino UNO to check the level of garbage filled.Radio Frequency Identification (RFID) is used for verification and also to inform server that the job is done.An android application is also used for remote monitoring of cleaning process there by avoiding the manual methods.Notifications are sent to android application with the help of WiFi module.

[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 informs the concerned authority about its status with the help of GSM/General Packet Radio Service(GPRS).A micro controller 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 maintain cleanliness in environment .This project can be enhanced further by making it compact and having separate dustbins for dry and wet wastes so that wet waste can converted 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 transmits the data to server for storing and further processing using WiFi. With the help of Artificial Intelligence even prediction of waste levels are calculated based on traffic congestion and by using optimization algorithms shortest path for waste collection informed to cleaners in a understandable format.Global Positioning System(GPS) is also made use to find better routes.This system can be enhanced for different types of wastes.

[5] proposed a system about Efficient Sensor Network for Vehicle Security. Today vehicle theft rate is very high, greater challenges are coming from thieves thus tracking/ alarming systems are being deployed with an increasingly popularity .As per as security is concerned today most of the vehicles are running on the LPG so it is necessary to monitor any leakage or level of LPG in order to provide safety to passenger. Also in this fast running world everybody is in hurry so it is required to provide fully automated maintenance system to make the journey of the passenger safe, comfortable and economical. To make the system more intelligent and advanced it is required to introduce some important developments that can help to promote not only the luxurious but also safety drive to the owner. The system “Efficient Sensor Network for Vehicle Security”, introduces a new trend in automobile industry.Smart Bin- An “Internet of Things Approach to Clean and safe Public Space”, in this author proposes a model in which Ultrasonic sensors are placed over dustbins to detect garbage level and compares with the prefixed threshold level.Once the threshold is reached the data is stored in the cloud so that this information can be used by authorities to take further action.The data stored in the cloud contains complete details about the location of dustbin.The project can be taken further by using solar power.

[6] 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 detection.A micro controller is connected to IR sensor for data transmission.GSM is used to communicate the information with truck drivers.In this system two thresholds are set once a first limit is reached a message is sent to truck driver and waits for acknowledgement if it is not received it sends again when the next limit is reached. Trash can closes its lid to avoid further dumping of garbage.If the trash is not cleared even after some time the alert is sent to higher authority for further action.With all these facilities it provides clean environment.

Sl No	Technology	Advantage	Disadvantage
1	Raspberry Pi	Cheap, Small size	Cannot run on X86 OS
2	Ultrasonic sensors	Senses all materials, higher sensing distance	Temperature sensitive
3	Android	Open source, many phone options	Prone to virus, battery drains

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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

Table 1: Comparison of technologies used in waste management

CONCLUSION

In this paper we have discussed various methods of waste management.We have considered solutions for checking status of trash cans, sending information to concerned person by giving shortest way to collect it. Using IoT there are many different and efficient solutions for waste management with minimum human intervention.

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