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Solid Waste and Management System using IoT

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Abstract — **As the second most populated country in the world India face a major problem in waste management. As of now there are traditional waste management system like manual periodic and routine clearing by the various governance bodies like the municipal corporation. But even though these routine maintenances are carried out we often came across overflowing garbage bins from which the garbage spills on the street. The main problem in the current waste management system in most of the Indian cities is in the unhealthy garbage management status. In our project we have tried to upgrade insignificant component of the urban waste management system. The basic idea behind project is to implement a smart idea of handling the garbage which is done by using IoT protocol for transmitting the dustbin status wirelessly, which can generate SMS to notify to the authorized person that system is filled with garbage and need to be unfilled. We have selected Arduino UNO platform. The ultrasonic sensor will show the level of garbage filled in dustbin, whereas the proximity sensor will detect the person present in front of dustbin and lid of the dustbin will automatically open.**

Keywords— Arduino UNO, Ultrasonic Sensor, Smart city, Garbage.

I. INTRODUCTION

Being a second most populated country in the world, India also leads to increase in the wastes. Due to inadequate waste collection, transport and disposal, India faces many environmental challenges. In the present situation more wastes are generated in urban area and this results on the environmental and public health. This project automatically detects the fullness of the bin and the bin location, and if the bin is fully filled the authorized person can know the location of it. Usually we need manual labors, by this garbage management system we reduce the man power with the help of embedded system is interfaced with IOT. The embedded device is a less expensive device use for automation. In each city a greater number of bins are there. Everyday garbage collecting vehicle roam around all the places to check the garbage bins but sometimes bins are not fully filled due to population around it. By this method we can know the location of 75% filled bin using this information garbage collecting vehicle driver can create an optimized path for it. This system is cost effective. To avoid all such hazardous situation and maintain public cleanliness and health this work is implemented on a smart garbage system. The main aim of the work is to develop a smart intelligent garbage alert system for a proper garbage management. This project proposes a smart monitoring system for garbage clearance by giving a fullness status to the municipal authorities for instant cleaning of dustbin with proper verification based on the level of garbage filling. Internet of Things is one the trending technologies of our time. It is used to connect various devices in a network that is made available anywhere within the range of the network. It allows a person to access his resources on the go. IoT uses this Internet technology that connects various "things" that communicate with each other to case the work and to automate the surroundings. The name "IoT" was coined by Kevin Ashton in 1999. IoT is an upcoming domain which has its applications in various fields including medicine, engineering, agriculture, industry, research, etc.

It highly reduces human intervention by automating the system. IoT is an interconnection of Wireless Sensor Network (WSN) devices which includes embedded devices with wireless sensors. This project tends to design an IOT based smart trash bin which will intimate the status of the trash bin to the respective authenticated person. The authorized person get the notification and they can locate the area remove the garbage bin and replace it with an empty one. The garbage bin consists of sensors it detects the waste is dropped, if it is sensed the sends the signal to the microcontroller and it check the waste is degradable or nondegradable by capacitive it can separate the waste pulled into corresponding container in the garbage can so. In top of the garbage can the ultrasonic sensor is placed to sense

the level of the waste. After that there is servo motor that is used to open and close the lid of the dustbin.

II. Related work

1. **IoT Based Smart Garbage and Waste Collection Bin by M. S. Killedar:**
   These dustbins are interfaced with microcontroller-based system having IR wireless systems along with central system showing current status of garbage, on mobile web browser with html page by Wi-Fi. Hence the status will be updated on to the html page. The main aim of this project is to reduce human resources and efforts along with the enhancement of a smart city vision.

2. **Waste Management Using Node MCU by Dr. A. Joshi:**
   The paper deals with waste management system with sensors. The sensors are used to identify the levels of waste in the bin. If the bin is full, notifications are sent. The main idea of the paper is to manage the waste and recycle the waste and use it for fertilizer.

3. **Smart Garbage Monitoring System Using Node MCU by Mamta Dhananjay:**
   This paper deals with the waste management system as soon as the bin is filled, it should be brought to the notice of municipality department so that it can be taken to garbage monitoring plants before the bins are covered with flies, rodents, most importantly before it smells foul polluting the city environment. This can also save fuel of trucks.

III. Objectives

- The project presents cost-effective design of a smart trash bin for small-scale and localized cases.
- Optimizing the process of garbage collection
- This project is to design and build a prototype for a smart automatic dustbin that can automatically open the lid when it detects the object nearby.
- It also can detect the level of the trash inside the dustbin. If the dustbin is full of trash at the certain level
- Dustbins are provided with a sensor which helps in tracking the level of the garbage in the bin and a unique ID will be provided for every dustbin in the city so that it is easy to identify which garbage bin is full.

IV. PROPOSED SCHEME

The main prototype of this project is to reduce Man Power and serve non stop cleaning facility. The system has two modules. The first one is E-monitoring system and the next is web interface system. The E-monitoring system deals with the hardware section whereas web interface system is the software part of the project. This is carried out by PIR Sensor, which help to open lid automatically when person approachesThe major part of this project involves the use of hardware components like Arduino UNO, Ultrasonic sensor and Servo motor. These are the major components of this smart bin.

WORKING PRINCIPLE:

E-MONITORING SYSTEM:
The three main components of this system are Arduino UNO, Ultrasonic sensor and Servo Motor. The ultrasonic sensor is used to determine if the waste bin is full or not whereas proximately detect the person in from of the dustbin and lid will open automatically. If the bin is full a flash message is displayed on the website. The Arduino UNO is used to link all the information collected from both the ultrasonic sensor to the website.

WEB INTERFACE SYSTEM:
The web interface system is regarding the website of the authorities. The user can register on the website by providing mobile number and/or e-mail id. The information collected from the sensors are linked to the website with the help of Arduino UNO.

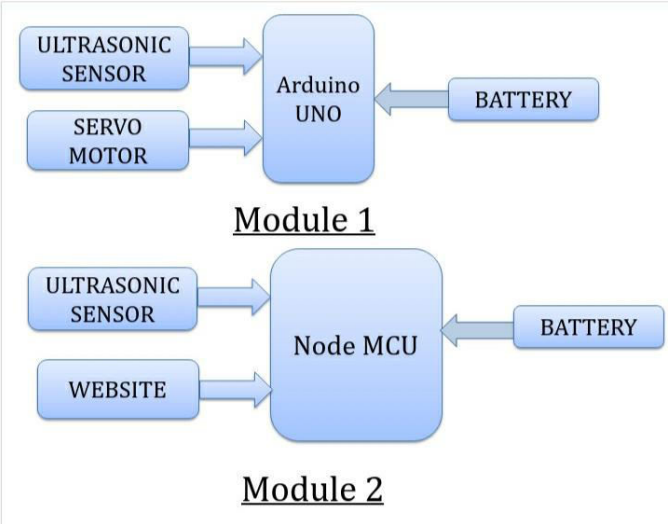

FIG: BLOCK DAIGRAM

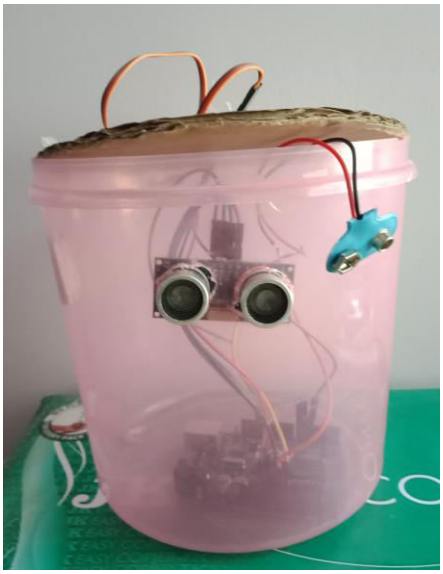

Fig. 1 Lid is closed.

V. MODULE DESCRIPTION

MODULE 1: There is a PIR Sensor in front of dustbin, which is to detect person if approaches and apparently monitor the fullness of bin. Whenever a person detects, the lid automatically open with the help of servo motor. Servo motor and ultrasonic sensor is connected with Arduino UNO with jumping wires and we can supply power via battery.

In fig 1, the lid closed because no one approaches it, it's a initial condition.

In fig 2, the lid is open when person approaches. PIR Sensor detect the person and with the help of servo motor it opens automatically.

Fig. 2 Lid open when person approaches

MODULE 2: The web interface system is regarding the website of the authorities. The user can register on the website by providing mobile number and/or e-mail id. The information collected from the sensors are linked to the website with the help of Arduino UNO.

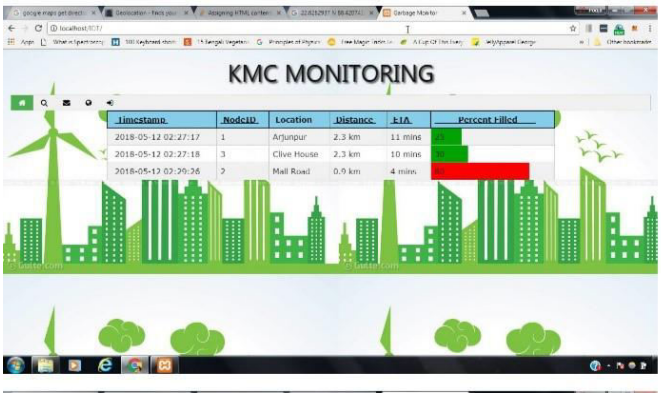

Fig.3 Front End Output

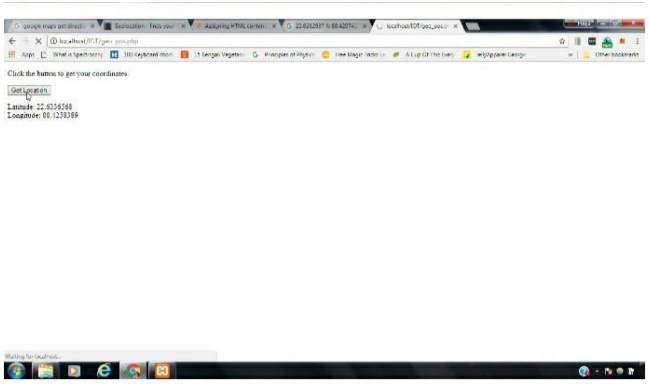

Fig.4 Location of a bin

IV.Conclusions

A proper waste management system is necessary for the development of any country. For a populous country like India, waste management is an area of concern. We are trying to give an effective solution to the waste management issue by our project named a solid waste monitoring system a smart trash bin. We truly hope that our system can make wonders in the Swachh Bharath venture. Using IOT the waste collection methodology moves to next level. The waste accumulated in the bin directly affects the environment and also affects the people's health. This project is helpful for the nation's **"**CLEAN INDIA MISION**".** This project when implemented reduces the human interference.

IV. REFERENCES

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[6] Prakash, Prabu, "IoT based waste management for smart city", International journal of Innovative Research in Computer and Communication Engineering, vol.4, Issue 2, February 2016, 1267-1274and also increases the efficiency of waste collection.