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IOT BASED WASTE MANAGEMENT SYSTEM

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Abstract - *As the urbanization is increasing day by day peoples are producing more waste than the past. Waste management is now becoming the most concerned topic thorough out the world. The management of waste is becoming more serious problem and it may aggravate numerous severe diseases for the nearby people. For mitigating the garbage's and maintains the cleanness, it requires 'smartness based waste management system'. This paper is proposed IOT based smart waste management system which checks the waste level over the dustbins by using sensor systems. The details of the bins can be directly viewed through app. The app shows the details of the bins like location of the bin, the amount of garbage in it and the time it was cleaned previously. Once the dustbin level is full it will directly send a notification to the authorities. This system will help workers to collect the waste from the bins which are fully filled and those who need urgent cleaning. This project is helpful for government 'SWATCHA BHARAT ABHIYAN'.*

Key Words – IOT, Arduino, Android app, Node MCU, GPS, Ultrasonic sensor, Inductive Proximity Sensor

1. INTRODUCTION

As the world is moving towards Smart Cities the amount of waste is increasing rapidly. Each city has different methods to tackle with waste management. But sometimes they failed to collect waste in proper time thus population of mosquitos increases in such area and disease are spread. So to tackle this problem we need an intelligent system to monitor waste in the dustbin and give time to time information about it to the authorities. This problem can be tackle with using IOT.

This paper shows a method to implement a smart dustbin which can segregate waste in common way such as Dry, Wet and Metallic with the help of sensors. Ultrasonic sensors are used to detect the level of the garbage inside dustbin and led's to show the level to public. Once the dustbin is full at 75% of it's capacity it will send first notification to the municipal authorities that dustbin is about to full so that they can empty bin and bin can be used again. But if authorities failed to empty bin in time they bin will be locked indicating red light.

An app is made to show the details of the dustbin like location of the dustbin, garbage level in each dustbin and how much waste is produced in that area. A database is made to store the information like who collected the garbage and how much garbage is collected in every day.

2. LITERATURE SURVERY

Proposed System – Dustbin overflow is one of the main reason behind increase in number of mosquito and diseases. Thus our proposed system can help to avoid the dustbin from overflowing. It uses Wi-Fi module (ESP-8266) to send data to the server side whenever the level of dustbin reaches to maximum level. This system can also segregate waste at source level itself in categories such as dry, wet and metallic so that it can make things easy for management and saves time. Implementation of this system can be done at any place with ease and in affordable cost.

3. SYSTEM ARCHITECTURE

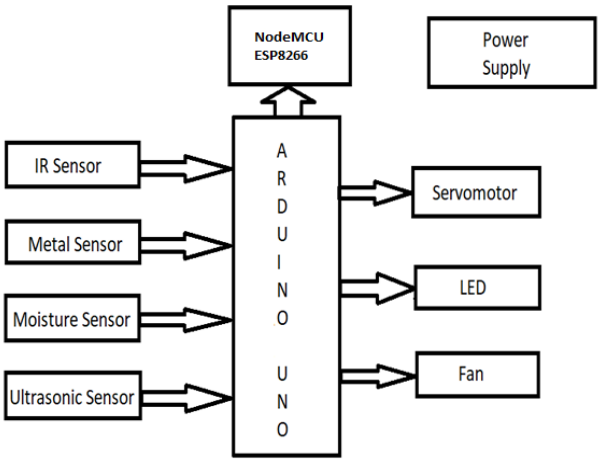

Fig-1: Descriptive Block Diagram

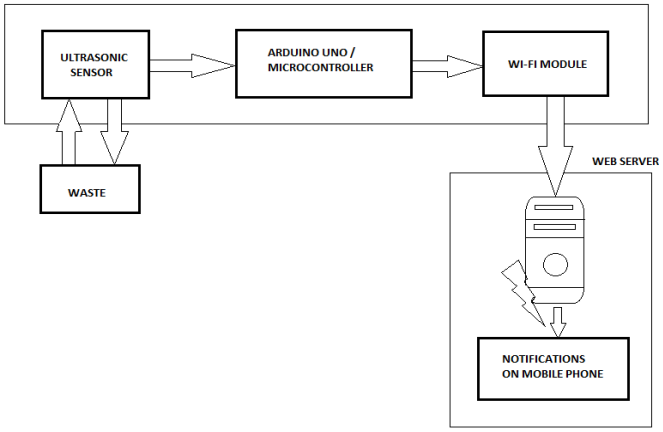

Fig-2: Flow of the Project

This system is consist of hardware and software. In this we have used two micro-controllers i.e. Arduino (ATmega328) and ESP8266. Arduino is used to collect data from different connected sensors. ESP-8266 Wi-Fi module is used to send realtime level of dustbins to the server side so that dustbin can be monitor regularly and database of them can be maintain. The dustbins also equipped with LED's so that user also can see how much dustbins are filled. An app is also developed for the system so that authenticated person can see the dustbin level and it's location in their smartphone.

a)Arduino Board

Arduino Uno is microcontroller board based on 8-bit ATmega328P microcontroller. The ATmega328P also supports I2C and SPI communication. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc to support microcontroller. Arduino software includes a serial monitor which allows to see simple textual data to be sent to and from the Arduino board. Arduino is used to connect different type of sensors, collect the data, analyse them and perform the necessary action with the help of code written in arduino IDE.

b) IR sensor

An infrared sensor is an electronic device, that emits IR waves in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object and detects the motion as well. The emitter is simply an IR LED (Light Emitting Diode) and detector is simply an IR photodiode that is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and output voltages will change in proportion to the magnitude of the IR light received. Here it is used to sense the presence of object near dustbin inlet.

c) Ultrasonic Sensor

An ultrasonic sensor is a sensor that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency sound waves reflect from the boundaries to produce distinct echo patterns. The working principle of this module is simple. It sends an ultrasonic pulse out at 40kHz which travels through the air and if there is an obstacle or object, it will bounce back to the sensor. By calculating the travel time and the speed of sound, the distance can be calculated.

d) Inductive Proximity Sensors

An **inductive sensor** is a device that uses principle of electromagnetic induction to detect or measure objects. An inductor develops a magnetic field when current flows through it, this effect can be used to detect metallic objects that interact with magnetic field. Inductive sensor is based on Faraday's law of induction.

e) Moisture Sensor

As the name suggest, Moisture sensor is used to detect the presence of moisture content in an object. It uses capacitance to measure dielectric permittivity of the surrounding medium. It works on 5 Volts and less than 20mA current.

f) NodeMCU(ESP-8266)

NodeMCU ESP8266 board comes with the ESP-12E module containing ESP8266 chip having 32-bit RISC microprocessor. ESP-8266 microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. It has 128 KB RAM and 4MB of Flash memory to store data and programs. It's high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects. NodeMCU Development Board can be easily programmed with Arduino IDE since it is easy to use.

g) Servo Motors

Servo Motors are small in size and lightweight but has high zoutput power. Servo can rotate approximately 180 degrees**.** These are perfect to used with arduino board.

4. Software Used

a)Arduino IDE –

It is an open source development platform through which arduino board can be programmed. It also contains necessary libraries to program NodeMCU so it makes coding both boards easy.

b)MIT app Inventor –

MIT App Inventor is a web application integrated development environment originally provided by Google, and now maintained by the Massachusetts Institute of Technology (MIT). It is used to create an app through which Municiple garbage collecting employee can log in and will receive notifiacations whenever dustbin gets full and it also shows location of the respective dustbin.

c)Backend Servers

1)Firebase Server

Firebase server is used to create databse of employees whenever they log in through the app.

2) ThingSpeak Server

ThingSpeak server is used to create the database of waste collected in dustbin So that municipal know how much and what type of is collected from respective area.

5. SOFTWARE FLOWCHART

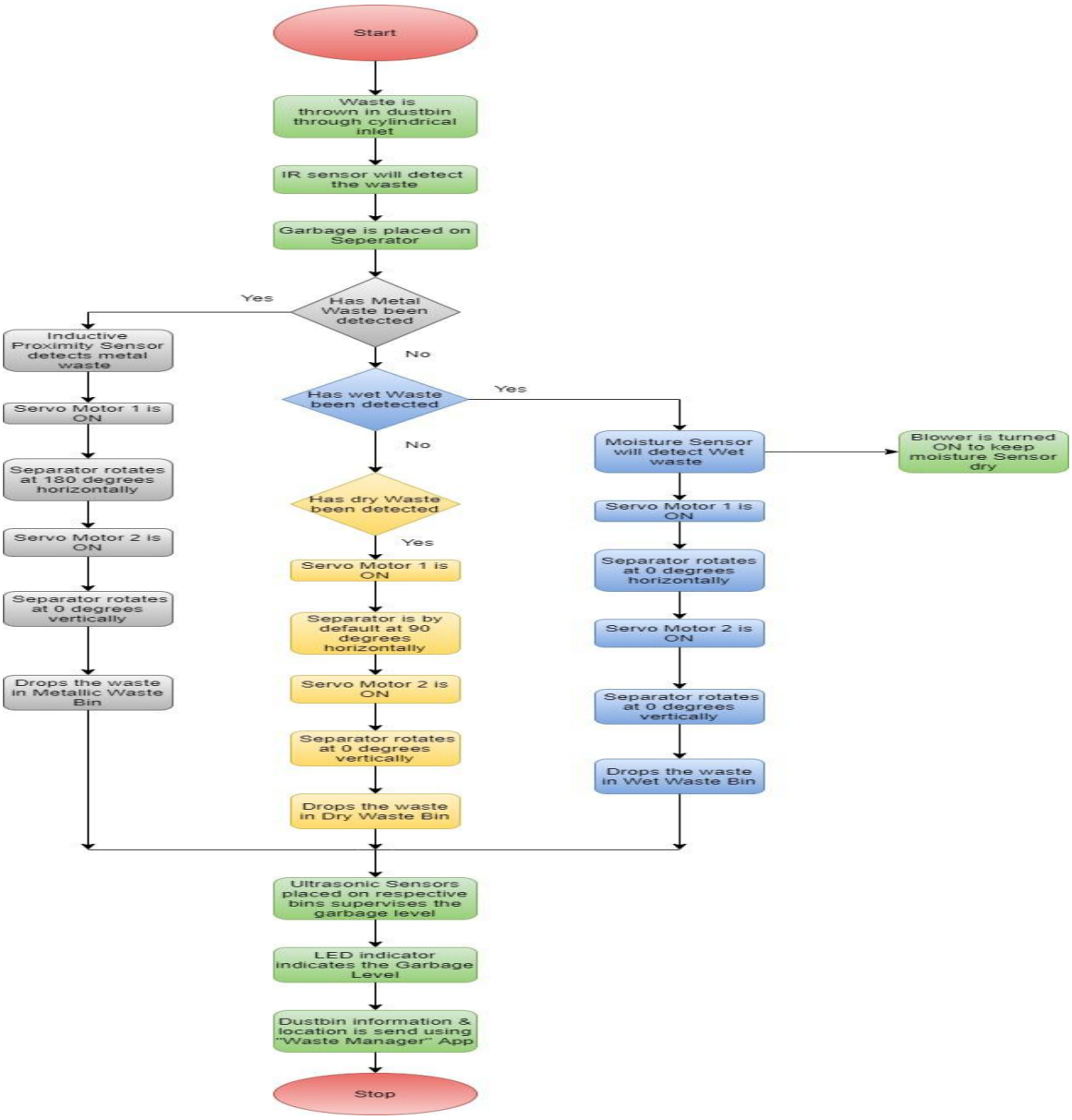

Fig-3: Flowchart

6. CONCLUSION

We have been a system which can segregate waste at source level in basic categories like dry, wet and metallic and also can monitor level of the inside the dustbins. The authorities can monitor the waste level in dustbins via a mobile app which receives notifications whenever dustbins gets full. We made a low cost waste management system with high accuracy sensors and cloud database so that it can help municipal workers and save their time.

7. FUTURE SCOPE

1. In this system we only demonstrated a single dustbin but in future many dustbins can be connected together so that when one gets full it can show nearby dustbin to the peoples.

2. We can make a web portal for all the dustbins.

3. App can be further modify so that locals also can see which nearby dustbin is empty.

4. Safety feature for the dustbin can also added in future.

8. REFERNCES

[1]Wikipedia.org\thingspeak

[2]Evaluation of Existing Solid Waste Management System in Una Town, India Disha Thakur, RajivGanguly, Ashok Kumar Gupta, Veeresh Gh ali

[3]Dissipation of waste using dynamic perception and alarming system: A smart city application by Ahmed Imteaj ; Mahfuzulhoq Chowdhury ; Md. Arafin Mahamud

[4]S.S Navghane, M.S. Killedar, Dr. V. M. Rohokale "IoT Based Smart Garbage and Waste Collection Bin" International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 5,Issue 5, May 2016.

[5]IoT based Connected Dustbins for Waste Management in Commercial Places Barath Chelliah P. Department of Mechatronics, Chennai Institute of Technology, Chennai