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GARBAGE LEVEL DETECTION SYSTEM USING IOT

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Abstract - *These days it is being quite common to see that large portions of the detritus over the roadside, also in many localities, dustbins are not being cleaned in appropriate time. It results as creation of an unhygienic condition and expansive number of creepy crawlies and mosquitoes. The traditional procedure following these days is time taking and requires high human effort which is not anywhere comparable to present day innovations in any scenario . To overcome this issue, an undertaking called IOT based garbage level detection system is proposed. The theme of this project is to portray savvy dustbins in view of arduino, ultrasonic sensor, Node MCU, which are interfaced with the web application through web server to put on a brilliant dustbin which will quantify the status of the dustbin. This system screens the trash canisters and educates about the level of waste gathered in the junk containers. This will likewise send status of bins to waste accumulation vehicles in web Page.*

Key Words: **Ultrasonic Sensor, Arduino, Arduino (Ide), Node Mcu**

1. INTRODUCTION

IOT or Internet Things refers to the network of connected physical objects that can communicate and exchange data among themselves without the desideratum of any human intervention. It has been formally defined as an "Infrastructure of Information Society" because IoT[8] sanctions us to amass information from all kind of mediums such as humans, animals, conveyances, kitchen appliances. Thus, any object in the physical world which canbe provided with an IP address to enable data transmission over a network can be made part of IOT system by embedding them with electronic hardware such as sensors, software and networking gear. IOT is different than Internet as in a way it transcends Internet connectivity by enabling everyday objects that utilizes embedded circuits to interact and communicate with each other utilizing the current Internet infrastructure Since then the scope of IoT has grown tremendously as currently it consists of more than12 billion connected devices and according to the experts it will increase to 50 billion by the end of 2020. With the advent of IOT both manufacturers and consumers have benefited. Manufacturers have gained insight into how their products are used and how they perform out in the real world and increase their revenues by providing value added services which enhances and elongates the lifecycle of their products or services. Consumers on the other hand have the ability to integrate and control more than one devices for a more customized and improved user experience. In this paper, we are going to propose a system for the immediate cleaning of the dustbins. As dustbin is considered as a basic need to maintain the level of cleanliness in the city, so it is very important to clean all the dustbins as soon as they get filled. We will use ultrasonic sensors [10] for this system. The sensor will be placed on top of bin which will help in sending the information to the office that the level of garbage has reached its maximum level. After this the bin should be emptied as soon as possible. The concept of IOT when used in this field will result in a better environment for the people to live in. No more unsanitary conditions will be formed in the city. With the help of this system minimal number of smart bins can be used around the whole city and the city will still be much cleaner [9].There has been an unprecedented growth in the number of devices being connected to the Internet since past few years. All these devices connected to the internet are part of the IOT infrastructure which can communicate with each other. The IOT network consists of embedded electronics, sensors and software that allows these devices to send and receive data among each other. This is why it is beneficial to use such an existing infrastructure for designing the proposed security system. The disadvantages of the existing system are that the employees have to go and check the bins daily whether they are filled or not, it results in high cost. If the bin doesn't get emptied on time then the environment becomes unhygienic and illness could be spread. The proposed system will help in removing all these disadvantages. The real-time information can be gained regarding the level of the dustbin filled on the system itself. It will also help in reducing the cost as the employees will have to go only at that time when the bin is full. This will also help in resource optimization and if the bins will be emptied at time then the environment will

remain safe and free from all kinds of diseases. The cities will become more cleaner and the smells of the garbage will be much less.

II. HARDWARE PLATFORM

The hardware part mainly consists of an Arduino Uno board, ESP8266 (Wi-Fi Module),Ultrasonic Sensorand Bread board and Jump wires.

A. Arduino Uno

An Arduino board historically consists of an Atmel 8-, 16-or 32-bit AVR microcontroller with complementary components that facilitate programming and incorporation into other circuits. An important aspect of the Arduino is its standard connectors, which let users connect the CPU board to a variety of interchangeable add-on modules termed shields. Some shields communicate with the [11] Arduino board directly over various pins, but many shields are individually addressable via an I^2C serial bus—so many shields can be stacked and used in parallel. It provides 14 digital I/O pins, six of which can produce pulse width modulated signals, and six analog inputs, which can also be used as six digital I/O pins. This board has a 5 volt linear regulator and a 16 MHz crystal oscillator.

B. ESP8266 (Wi-Fi Module)

ESP8266 is a Wi-Fi module which will give your projects access to Wi-Fi or internet. It is a very cheap device but it will make your projects very powerful. It can communicate with any microcontroller and make the projects wireless. It is in the list of most leading devices in the IOT platform. It runs on 3.3V and if you will give it 5V then it will get damage. The ESP8266has 8 pins; the VCC and CH-PD will be connected to the 3.3V to enable the wifi. The TX and RX pins will be responsible for the communication of ESP8266 with the Arduino. The RX pin works on 3.3V so you will have to make a voltage divider for it as it used for implementation.

C. Ultrasonic Sensor

The Ultrasonic Sensor is used to measure the distance with high accuracy and stable readings. It can measure distance from 2cm to 400cm or from 1 inch to 13 feet. It emits an ultrasound wave at the frequency of40KHz in the air and if the object will come in its way then it will bounce back to the sensor. By using that time which it takes to strike the object and comes back, you can calculate the distance. Distance can be measured by equation 1.

Distance = Time * sound speed /2. (1)

Where Time = the time between an ultrasonic wave is received and transmitted. It has fourpins. Two are VCC and GND which will be connected to the 5V and the GND of the Arduino while the other two pins are Trig and Echo pins which will be connected to any digital pins of the Arduino. The trig pin will send the signal and the Echo pin will be used to receive the signal. To generate an ultrasound signal, you will have to make the Trig pin high for about10us which will send a 8 cycle sonic burst at the speed of sound and after striking the object, it will be received by the Echo pin

D. Bread board and Jump wires

A modern solder less breadboard consists of a perforated block of plastic with numerous tinplated phosphor bronze or nickel silver alloy spring clips under the perforations. The clips are often called tie points or contact points. The number of tie points is often given in the specification of the breadboard. The spacing between the clips (lead pitch) is typically 0.1 in(2.54 mm). Integrated circuits (ICs) in dual in-line packages (DIPs) can be inserted to straddle the centerline of the block. Interconnecting wires and the leads of discrete components (such as capacitors, resistors, and inductors) can be inserted into the remaining free holes to complete the circuit. Where ICs are not used, discrete components and connecting wires may use any of the holes. A breadboard is utilized to build and test circuits expeditiously before finalizing any circuit design. The breadboard has many apertures into which route components like ICs and resistors can be connected.

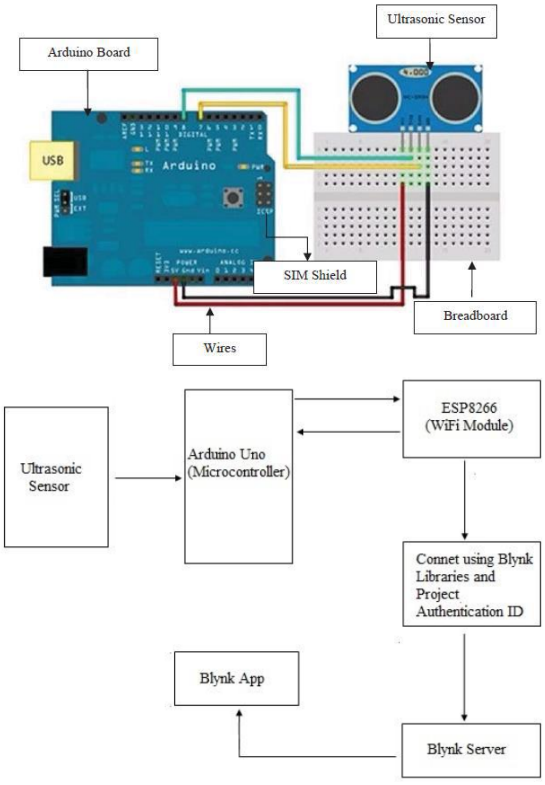
III. METHODOLOGY

The existing system has the limitations as time consuming, trucks go and empty the containers, even they are empty. The cost is high with unhygienic environment. Even the badodour causes the unhealthy environment. So, proposed model talks about how to make use of the recent advancements in technology to make our place clean and tidy. The implementation starts by setup ESP8266 by flashing the latest version of the firmware. This enable s the Bylnk libraries efficiently communicate and avoid producing error.. To flash the latest firmware, download the ESP8266 flasher tool and the latest firmware from the internet which would be in the bin format and flash the ESP8266 with it. Once the ESP8266flashing done, other components can be added to the configuration. We need breadboard to connect

the microcontroller, ultra sonic sensor, buzzer and the ESP8266 using the jumper wires[13]. The breadboard is used to interface between the various components available. It also makes it easy to connect multiple inputs to a single pin on the arduino board. The connection of hardware parts are shown

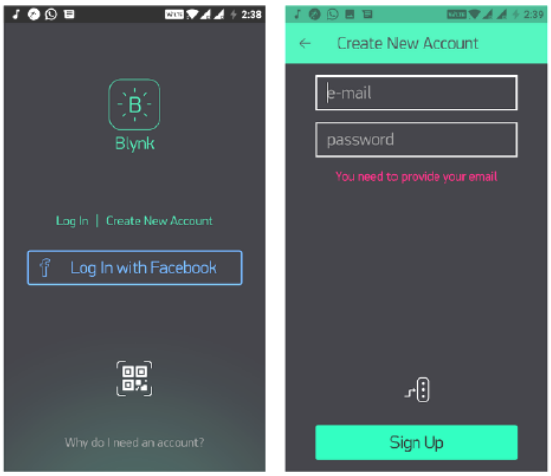
Figure 1

Following sketch diagram as shown in Figure 1, shows how the components are supposed to be connected together using the breadboard and the jumper wires. The architecture diagram is shown in figure 2.

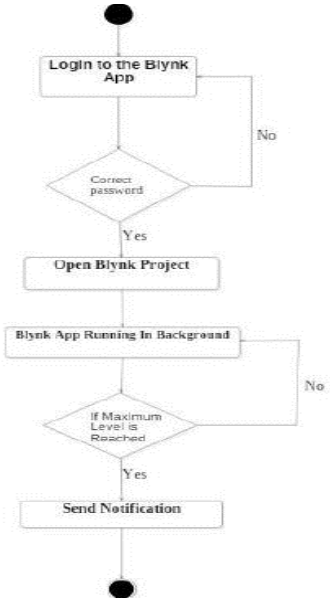


Configuring Bylnk App

To connect to the internet we make use of a prebuilt platform called Blynk app. After the userinstalls the Blynk app on the smartphone, an account to be created in the app to access itsservices. The services are enabled for the signed users. Let us create an account and add anew project to get started. An unique authentication code is used by the code to communicatewith the project. The [14]Blynk needs to be running in the background for the user to get real timenotifications. The working process of the proposed model can be clearly seen in the followingfigure 3. The configuration of Blynk app and account creation is shown in figure



WORKING PROCESS



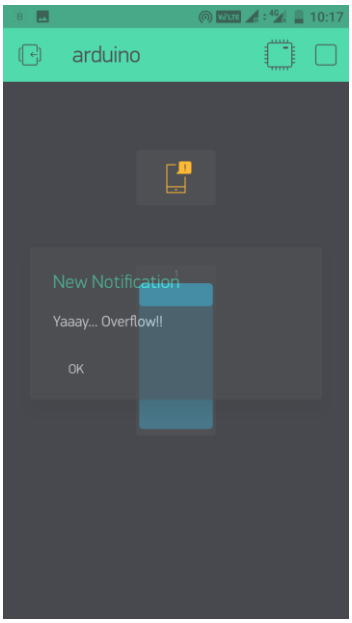
After the account creation, the arduino will first read the ultrasonic sensor, It will send the signal with the speed of sound. It revert back after striking the object and the travel time isstore[12] based on equation1. Thus the distance of the object is calculated. Based on the distancewe can identify the garbage level to be low or high. We used the term “overflow” to indicatethe necessary for cleaning process. Thus the mobile is enable with the term as “Overflow”.Sample code is given below implemented in the proposed work.

Sample Code:

```
#define BLYNK_DEBUG
#define BLYNK_PRINT Serial
//Include ESP and Blynk libraries
#include <ESP8266_SoftSer.h>
#include <BlynkSimpleShieldEsp8266_SoftSer.h>
#include <SimpleTimer.h>
SimpleTimer timer;
// Set ESP8266 Serial object
#include <SoftwareSerial.h>
SoftwareSerialEspSerial(2, 3); // RX, TX
ESP8266 wifi(EspSerial);
const int trigPin = 8;
const int echoPin = 9;
char auth[] = "f07820f6001843bca8052d3ef336eade";
void setup() {
Serial.begin(9600);
// Set console baud rate
Serial.begin(9600);
delay(10);
// Set ESP8266 baud rate
// 9600 is recommended for Software Serial
EspSerial.begin(9600);
delay(10);
Blynk.begin(auth, wifi, "hash", "abc123mnb");
timer.setInterval(3000, CheckDistance);
}
.
.
.
void CheckDistance()
{
long duration, inches;
pinMode(trigPin, OUTPUT);
digitalWrite(trigPin, LOW);
delayMicroseconds(2);
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);
pinMode(echoPin, INPUT);
duration = pulseIn(echoPin, HIGH);
inches = microsecondsToInches(duration);
cm = microsecondsToCentimeters(duration);
Serial.print(inches);
Serial.print("in ");
Serial.println();
Blynk.virtualWrite(V5, inches);
//Check whether Bin is full or not
if(inches < 2)
{
Blynk.virtualWrite(V3, 255);
Blynk.notify(" yaaay Overflow!!");
}
delay(1000);
}
```

EXPERIMENTAL EVALUATION

The system was checked repeatedly by increasing and decreasing the level of garbage in the bin. Notification was sent each time the level got changed. The user checked the notification was checked by the user on the blynk app, so it can be said that the system has worked in the way we planned. Proper security was also given to the hardware components so that theoutput which comes is accurate because further actions have to be taken based on the output.The result of the notification is provided in figure below.



V. DISCUSSIONS ANDCONCLUSIONS

The main objective is to maintain the level of cleanliness in the city and form an environment which is better for living. By using this system we can constantly check the level of [15]the garbage in the dustbins which are placed in various parts of the city. If a particular dustbin has reached the maximum level then the employees can be informed and they can immediately take certain actions to empty it as soon as possible. The employees can check the status of these bins anytime on their mobile phones. This can prove to be a very useful system if used properly. The system can be used as a benchmark by the people who are willing to take one step

further for increasing the cleanliness in their respected areas. Ultrasonic sensor is being used. in this system to check the level of garbage in the dustbins but in future various other types of sensors can be used with the ultrasonic sensor to get more precise output and to take this system to another level. Now this system can be used in certain areas but as soon as it provesits credibility it can be used in all the big areas. As this system also reduces manual work certain changes can be done in the system to take it to another level and make it more useful for the employees and people who are using it. In future, a team can be made which will be in charge for handling and maintaining this system and also to take care of its maintenances.

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