**VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM 59014**

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Internet of Things Project Report on

**“SMART TRASH BIN”**

By

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Under the Guidance of

**Panimozhi K**

Assistant Professor , Department of CSE

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IoT Application Development carried out

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Department of Computer Scienc and Engineering

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(Autonomous college under VTU)

P.O. Box No.: 1908, Bull Temple Road, Bangalore-560 019

2017-2018

**BMS College of EngineerinG**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

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***CERTIFICATE***

This is to certify that the Internet of Things project titled “**Smart Trash Bin**” has been carried out by **Shreeprada Divakar Bhat (1BM15CS100), Sowkhya S Adiga(1BM15CS110) and Ishwika Mohandas Shetty (1BM15CS134)** during the academic year 2017-2018.

Signature of the guide

**Panimozhi K**

Assistance Professor

Department of Computer Science and Engineering

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**Examiners**

**NAME: SIGNATURE:**

**BMS College of EngineerinG**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

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***DECALARATION***

We, **Shreeprada Divakar Bhat (1BM15CS100), Sowkhya S Adiga(1BM15CS110) and Ishwika Mohandas Shetty (1BM15CS134)** students of 5th Semester, B.E, Department of Computer Science and Engineering, BMS College of Engineering, Bangalore, hereby declare that, this IoT Application development work entitled "SMART TRASH BIN" has been carried out by us under the guidance of Panimozhi K, Department of CSE, BMS College of Engineering, Bangalore during the academic semester Aug-Dec 2017

We also declare that to the best of our knowledge and belief, the development reported here is not from part of any other report by any other students.

Signature

Shreeprada Divakar Bhat (1BM15CS100)

Sowkhya S Adiga(1BM15CS110)

Ishwika Mohandas Shetty (1BM15CS134)

**Introduction**

**Objective of the project**

This project aims to develop an automated trash bin that opens automatically when people come near it and send’s message to municipal commission when it is full once it gets filled.

**Abstract or description about the project**

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The above figure describes the block diagram of the monitoring system. It consists of several ultrasonic sensors, the Arduino Uno and the GSM module.One ultrasonic sensors is used to detect the level of garbage in each bin, and it will send this information to the Arduino Uno, which acts as the system controller. In the case where the bins are already full or almost full, then it will generate a warning message which will be sent to the municipality via SMS, by using the GSM module. Moreover, this system is also connected to several LEDs, in red colours, in order to alert all the people regarding the bin status. The ultrasonic sensor is used to monitor the opening of dustbin when people passes by.

**Literature Survey**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl.No** | **Name of the Project or Product (Existing)** | **Commercial or Non-Commercial** | **Features** |

1. **Smart Trash Bin Commerecial Automatic Trash**

**Feature and its advantage**

At first, the level or the height of the garbage in each bin is measured by using the ultrasonic sensor. This information is then received and processed by the Arduino Uno. It will determine whether the garbage level has been surpassing the threshold level or not. For this research purpose, there are two threshold levels sets: the first threshold is at 70% of the bin height, and the second threshold is set at 90% of the bin height. If the garbage level in the bin is crossing the last threshold level, then the a warning message is generated and sent to the municipality. Besides, the LEDs will be turned ON in order to alert all the residents at every floor. Next, if the garbage level in the bin is crossing the second threshold level, then the second warning message is generated and sent to the municipality. In this case, all the residents will be alerted when the red LEDs are turned ON.

**Advantages**

It is very useful in improving the efficiency of solid waste disposal management especially in the flat residential areas, where the garbage piles at the bins are one of the residents’ major concerns owing to its ability to continuously measure the garbage level in the bin and alerting the municipality for immediate collection.

**Hardware and Software Requirements**

**Hardware requirement**

Arduino Uno

Ultrasonic Sensors

LEDs

Servo Motor

GSM Module

Bread board

**Do cost analysis {separately}**

|  |  |
| --- | --- |
| **DEVICES** | **COST** |
| BreadBoard | Rs 80 |
| LED | Rs 6(3pcs) |
| Arduino Board | Rs 370 |
| Wires | Rs 20 |
| Ultrasonic Sensor | Rs 300 |
| GSM Module | Rs 800 |
| USB Cable | Rs 40 |
| Power Adapter | Rs 150 |
| Servo Motor | Rs 350 |
| Connecting Wires | Rs 80 |
| TOTAL | Rs 2,196 |

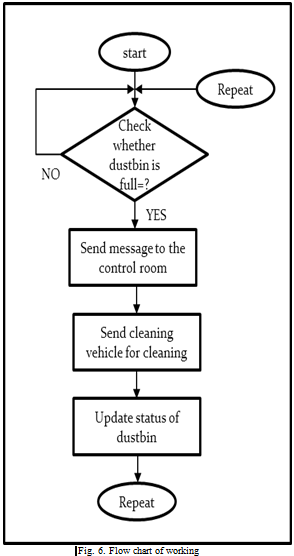
**Software Requirements**

**OS -Windows**

**IDE- Arduino UNO IDE**

**Design**

FLOWCHART

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**Architectural diagram or Circuit diagram**

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**Servo motor connection**

**11 (orange)**

**GND (dark brown)**

**5V (red)**

**Explanation about your design { interaction between elements}**

An Arduino Uno board is connected to 2 HC-SR04 ultrasonic sensor via digital I/O pin. Besides, the SIM800A GSM Module is serially connected to the Arduino Uno board, where the TX port of the GSM Module is connected to the RX port (PIN 9) of the Arduino Uno, while RX port of the former is tied to the TX port (PIN 10) of the latter. Moreover, 3 red LED are also connected to the Arduino Uno. Ultrasonic sensor placed outside helps in the automatic opening of the dustbin using Servo motor. The second ultrasonic sensor is placed at the top of the dustbin. The first test conducted is the situation where the garbage bin is empty or its garbage level is very low. As can be observed in, neither of LEDs is turned on. Then, the bin is filled with more garbage until its level has surpassed the first threshold value, which is set to 30%. Shows that the lower LED is turning ON the other LEDs are turned on when the waste reaches the level 60% and 90% respectively. The warning SMS is sent, telling the municipality to immediately collect the waste disposal.

**Implementation**

**Steps to be followed to execute your project**

1. Connect arduino board to the laptop.
2. Power on the GSM.
3. Then the module is powered.
4. When you take the garbage towards the ultrasonic sensor ,it detects it and with the help of motor the lid is automatically opened.
5. As the dustbin goes on filling the led’s glow based on the level of garbage inside the dustbin.
6. As soon as the dustbin fills up all the 3 led’s glow and a message is sent to the garbage collector saying the dustbin is full using GSM module.

**Source code**

#include <SoftwareSerial.h>

SoftwareSerial mySerial(9, 10);

#include <Servo.h>

Servo myservo;  // create servo object to control a servo twelve servo objects can be created on most boards

int pos = 0;    // variable to store the servo position

const int trigmessage = 2;

const int echomessage = 4;

const int trigmotor=7;

const int echomotor=8;

int led1 =13;

int led2 =12;

int led3 = 6;

void setup() {

  pinMode(led1,OUTPUT);

  pinMode(led2,OUTPUT);

  pinMode(led3,OUTPUT);

  mySerial.begin(9600);   // Setting the baud rate of GSM Module

  Serial.begin(9600);

  myservo.attach(11);  // attaches the servo on pin 9 to the servo object

}

void loop()

{

  long duration,duration1, cm1, cm;

  pinMode(trigmessage, OUTPUT);

  digitalWrite(trigmessage, LOW);

  delayMicroseconds(2);

  digitalWrite(trigmessage, HIGH);

  delayMicroseconds(10);

  digitalWrite(trigmessage, LOW);

  pinMode(echomessage, INPUT);

  duration = pulseIn(echomessage, HIGH);

  cm = microsecondsToCentimeters(duration);

  pinMode(trigmotor, OUTPUT);

  digitalWrite(trigmotor, LOW);

  delayMicroseconds(2);

  digitalWrite(trigmotor, HIGH);

  delayMicroseconds(10);

  digitalWrite(trigmotor, LOW);

  pinMode(echomotor, INPUT);

  duration1 = pulseIn(echomotor, HIGH);

  cm1 = microsecondsToCentimeters(duration1);

  Serial.print("motor = ");

  Serial.println(cm1);

  Serial.print("message =");

  Serial.println(cm);

  if(cm1<=10)

  {

    for (pos = 0; pos <= 180; pos += 1) { // goes from 0 degrees to 180 degrees in steps of 1 degree

      myservo.write(pos);              // tell servo to go to position in variable 'pos'

      delay(15);                       // waits 15ms for the servo to reach the position

    }

    delay(500);

    for (pos = 180; pos >= 0; pos -= 1) { // goes from 180 degrees to 0 degrees

      myservo.write(pos);              // tell servo to go to position in variable 'pos'

      delay(15);                       // waits 15ms for the servo to reach the position

    }

  }

  if(cm<5)

  {

    digitalWrite(led1,HIGH);

    digitalWrite(led2,HIGH);

    digitalWrite(led3,HIGH);

    SendMessage();

   while(cm<5)

    {

      duration1 = pulseIn(echomessage, HIGH);

    cm = microsecondsToCentimeters(duration1);

      delay(2000);

    }

  }

  if(cm<10)

  {

    digitalWrite(led2,HIGH);

    digitalWrite(led3,HIGH);

  }

  if(cm<15)

  {

    digitalWrite(led3,HIGH);

  }

 delay(3000);

}

long microsecondsToCentimeters(long microseconds)

{    return microseconds / 29 / 2;

}

void SendMessage()

{

  mySerial.println("AT+CMGF=1");    //Sets the GSM Module in Text Mode

  delay(1000);  // Delay of 1000 milli seconds or 1 second

  mySerial.println("AT+CMGS=\"+918970481603\"\r"); // Replace x with mobile number

  delay(1000);

  mySerial.println("Dustbin is full replace it");// The SMS text you want to send

  delay(100);

  mySerial.println((char)26);// ASCII code of CTRL+Z

  delay(1000);

}

**Conclusion**

This report has described the development of a smart garbage monitoring system, which is based on Arduino Uno microcontroller. It is very useful in improving the efficiency of solid waste disposal management especially in the flat residential areas, where the garbage piles at the bins are one of the residents’ major concerns owing to its ability to continuously measure the garbage level in the bin and alerting the municipality for immediate collection. The outputs from the conducted tests show that all the functionality of the system has performed correctly. The proposed system is suitable to be implemented in all flat residential areas, due to its practicality, reliability and reasonable cost.

**References**

Reference Books:

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applications and Protocols‖, Wiley, 2012

2. Internet of Things with Arduino: Build Internet of Things Projects With the Arduino

Platform by Marco Schwartz

3. Enabling Things to Talk - Designing IoT solutions with the IoT Architectural Reference