SMART WASTE MANAGEMENT SYSTEM

P.Sandeep[1], N.Obul reddy[2] ,Y.Chaitanya[3],G.Aravind[4],T.Sreejith[5]

[1] *Student, Electronics And Communication, SRM Institute of Science and Technology, Tamil Nadu, India*

[2] *Student, Electronics And Communication, SRM Institute of Science and Technology, Tamil Nadu, India*

[3] *Student, Electronics And Communication, SRM Institute of Science and Technology, Tamil Nadu, India*

[4] *Student, Electronics And Communication, SRM Institute of Science and Technology, Tamil Nadu, India*

[5]*Student, Electronics And Communication, SRM Institute of Science and Technology, Tamil Nadu, India*

ABSTRACT

Waste management is all the activities and actions required to manage waste from its inception to its final disposal

[1]. This includes collection, transportation, treatment and disposal of waste together with monitoring and regulation. Waste collection methods vary widely among different countries and regions. Domestic waste collection services are often provided by local government authorities.

Curbside collection is the most common method of disposal in most countries, in which waste is collected at regular intervals by specialised trucks. Waste collected is then transported to an appropriate disposal area.

Nowdays, cities with developing economies experience exhausted waste collection services, inadequately managed and uncontrolled dumpsites and the problems are worsening

[2]. Waste collection method in such countries is an on-going challenge and many struggle due to weak institutions and rapid urbanization.

KEYWORDS: *Aurdino board,GSM module,Ultrasonic sensor.*

I.INTRODUCTION

- ❖ By 2030, almost two-third of the world's population will be living in cities. This fact requires the development of sustainable solutions for urban life, managing waste is a key issue for the health.

- ❖ Efficient and energy-saving waste management, reducing CO_2,air pollution and vehicle exhaust emissions—these are just a few examples for the demands of future cities. In views of that, the efficient use and responsible handling of resources become more important.

- ❖ Effectively managing waste is important in developed countries. Waste management may swallow upto 50% of a city's budget, but only serve a small part of the population.

- ❖ Sometimes, upto 60%of waste is not being collected, it is often simply burned by the roadside. It can pollute drinking water, it can spread disease to people living nearby.

- ❖ Even with great route optimization, the worker must still physically go to the dustbin to check waste levels. Because of this, trucks often visit containers that do not need emptying, which wastes both time and fuel.

❖ Waste management prevents harm to human health and the environment by reducing the volume and hazardous character of residential and industrial waste.

❖ Improving proper waste management will reduce pollution, recycle useful materials and create more green energy.

FEATURES OF SMART WASTE MANAGEMENT SYSTEM

❖ The smart, sensor based dustbin will judge the level of waste in it and send the messege directly to the municipal corporation.

❖ It can sense all the type of waste material either it is in the form of solid or liquid.

❖ According to the filled level of the dustbin, the vehicles from the municipal corporation will choose the shortest path with the help of the "TRANSPORTATION SOFTWARE", which will save their time.

❖ It emphasizes on "DIGITAL INDIA".

❖ The system is simple. If there is any problem with any equipment in the future, that part is easily replaceable with new one without any difficulty and delay.

MAIN EQUIPMENTS USED IN THE SMART WASTE MANAGEMENT SYSTEM

1) GARBAGE CONTAINER

A waste container is a container for temporarily storing waste, and is usually made out of metal or plastic.

2) ULTRASONIC SENSOR

A special sonic transducer is used for the ultrasonic proximity sensors, which allows for alternate transmission and reception of sound waves. The sonic waves emitted by the transducer are reflected by an object and received back in the transducer. After having emitted the sound waves, the ultrasonic sensor will switch to receive mode. The time elapsed between emitting and receiving is proportional to the distance of the object from the sensor.
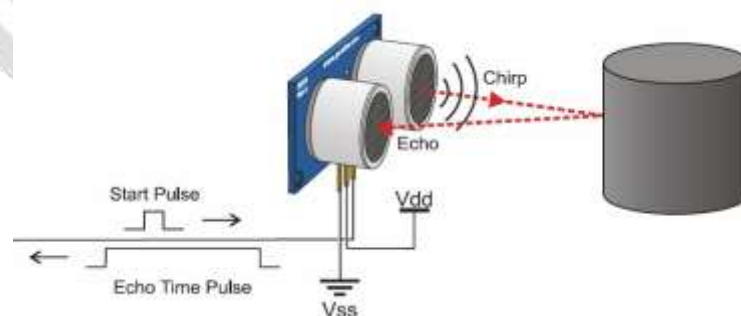

WORKING OF SENSOR

3) ARDUINO BOARD

Arduino is a software company, project, and user community that designs and manufactures computer open-source hardware,open-source software, and microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices [3].The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog I/O pins that can interface to various expansion boards (termed *shields*) and other circuits. The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino project provides an

integrated development environment(IDE) based on a programming language named *Processing*, which also supports the languages C and C++.
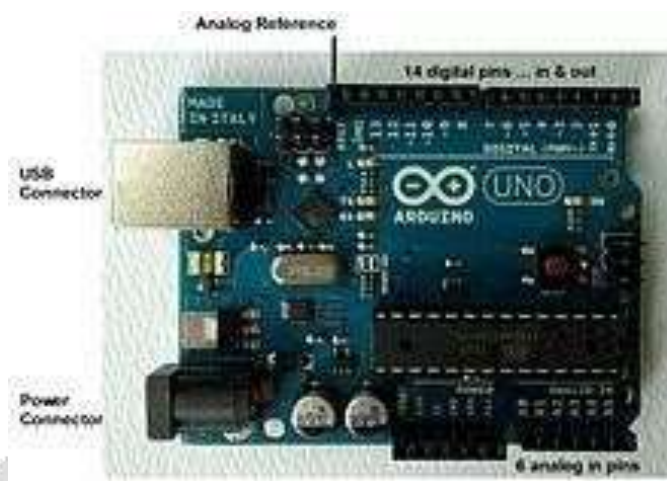
ARDUINO BOARD

4)   GSM MODULE

GSM (Global System for Mobile Communications, originally *Groupe Spécial Mobile*), is a standard developed by the European

Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used bymobile phones, first deployed in Finland in July 1991 [5]. As of 2014 it has become the default global standard for mobile communications - with over 90% market share, operating in over 219 countries and territories [6].

LITERATURE SURVEY

An inevitable consequence of development and industrial progress is generation of waste. Therefore, efficient waste management is a matter of international concern and countries have setup robust regulatory waste management regimes for balancing the objectives of development and environment sustainability. In India, the national environment policy, 2006 while suggesting measures for collection of wastes and safe disposal of residues [7].

The metro cities and major economic hubs generate the maximum volume of waste, but a survey of 20 smaller cities selected to be developed as smart cities show that most are struggling to manage waste. So, there should be an improvement in the waste management techniques.

VARIOUS PROGRAMS USED IN THE SYSYTEM

PROGRAM FOR WASTE LEVEL SENSING

```
#define trigPin 12

#define echoPin 13

void setup()
{
        Serial.begin (9600);

        pinMode(trigPin, OUTPUT);

        pinMode(echoPin, INPUT);

}
void loop()
{
        long duration, distance;

            int max = 80; // Let consider as Height of the Garbage Bin is = 80 cm.
        float diff, perc;
        digitalWrite(trigPin, LOW);
        delayMicroseconds(2);
        digitalWrite(trigPin, HIGH);
        delayMicroseconds(10);
digitalWrite(trigPin, LOW);

        duration = pulseIn(echoPin, HIGH);

        distance = (duration/2) / 29.1;

 diff = max - distance; // 'diff' variable tells u that, how much the Garbage Bin is Left to fill.
        perc = (diff/max)*100;                    // 'perc' variable tells u that, how much percentage the
Garbage Bin is filled.
```

```
    if (perc>=90)

{

            Serial.println("Garbage Bin is FULL.");              // When the Garbage Bin is filled
more than 90%, then this Error Message will Displayed.

}

 else

{

         Serial.print("Garbage Bin is Filled ");

          Serial.print(perc);

         Serial.println("  %.");              // These 3 Lines are print, that how much the Garbage
Bin is Filled...Ex. "Garbage Bin is Filled 70%.".

}

/*

    if (distance >= 400 || distance <= 2)

{

            Serial.println("Out of range");

}

 else

{

         Serial.print(distance);
         Serial.println(" cm");

}

*/


                            delay(500);
```

PROGRAM FOR MESSAGE SENDING

```
SoftwareSerial mySerial(9, 10);

#define trigPin 12
#define echoPin 13
```

```
void setup()

{

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

Serial.begin (9600);

pinMode(trigPin, OUTPUT);

pinMode(echoPin, INPUT);

delay(100);

}

void loop()

{

long duration, distance;

int max = 80; // Let consider as Height of the Garbage Bin is = 80 cm.

float diff, perc;

digitalWrite(trigPin, LOW);

delayMicroseconds(2);

digitalWrite(trigPin, HIGH);

delayMicroseconds(10);

digitalWrite(trigPin, LOW);

duration = pulseIn(echoPin, HIGH);

distance = (duration/2) / 29.1;

diff = max - distance; // 'diff' variable tells u that, how much the Garbage Bin is Left to fill.

perc = (diff/max)*100;      // 'perc' variable tells u that, how much percentage the Garbage Bin is filled.

if (perc>=90)

{

//Serial.println("Garbage Bin is FULL.");               // When the Garbage Bin is filled more than 90%, then
this Error Message will Displayed.
```

```
// Call the Function of Send SMS.

SendMessage();                          // Send Message Function Call.


}
/*
else

{

Serial.print("Garbage Bin is Filled ");

Serial.print(perc);

Serial.print("  %.");                                  // These 3 Lines are print, that how much the Garbage

Bin is Filled...Ex. "Garbage Bin is Filled 70%.".

}
*/

/*

if (distance >= 400 || distance <= 2)

{

Serial.println("Out of range");

}

else

{

Serial.print(distance);
Serial.println(" cm");

}
*/

delay(500);

}

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=\"+918792574742\"\r");         // Replace x with mobile number delay(1000);

mySerial.println("Garbage Bin is Full.");               // The SMS text you want to send delay(100);

mySerial.println((char)26);                             // ASCII code of CTRL+Z delay(1000);
```

CONCLUSION

Virtual reality is the advanced aid which makes a person's presence move around in it and interact with virtual features or items. This technology have led to massive up gradation of the society. From virtually at a distant place. A person using virtual reality equipment is able to "look around" the artificial world, and with high quality VR education to national security, virtual reality has made an effective advancement. From their earliest age, the next generation will be surrounded by virtual reality in all aspects of their life. In school, virtual environments will be learning grounds for biology, space, history, civics and more.

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