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SMART GARBAGE BIN

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ABSTRACT:
The smart trash can utilizes an ultrasonic sensor (like SONAR) to detect garbage proximity, prompting the servo motor to open the lid when garbage is nearby and closing it otherwise. By this our smart trashcan features sensor-based opening, enabling touchless operation for convenient disposal, ideal for hands-free access when busy or avoiding contact. Additionally, a moisture detector segregates wet and dry waste as per government protocols. An odour detector alerts users to foul smells, prompting timely disposal. A red LED indicates fullness, aiding efficient waste management. This innovative solution enhances public sanitation, suitable for street installation. An accompanying app locates nearby available bins, promoting convenient disposal.

Keyword - garbage, smart trash can

INTRODUCTION:

Smart trash cans, also known as intelligent waste bins or automated garbage bins, are innovative solutions designed to streamline waste management processes by incorporating technology into traditional waste disposal systems. Traditional smart trash cans are only equipped with sensors that detect when waste is added or when the bin reaches a certain capacity level. These sensors can be infrared, ultrasonic, or weight-based, depending on the design and functionality of the trash can. Some smart trash cans feature automatic compaction systems that compress the waste inside the bin, allowing it to hold more garbage before requiring emptying. This feature helps optimize space and reduce the frequency of waste collection.

This smart garbage bin not only has the above traditional features but it is also equipped with odour detector that alerts users to foul smells , prompting timely disposals. A red LED indicates fullness, aiding efficient waste management. Additionally, a moisture detector segregates wet and dry waste as per government protocols. This innovative solution enhances public sanitation, suitable for street installation. An accompanying app locates nearby available bins, promoting convenient disposal.

WORKING PRINCIPLE:

This present innovation in smart trash cans integrate advanced technology to revolutionize waste management processes. Equipped with a SONAR sensor, these bins detect the proximity of garbage, activating a servo motor to open the lid upon sensing nearby waste. Complementing this

feature, conventional odourdetecting sensors swiftly alert users to foul smells, prompting prompt disposal and maintaining hygiene.Moreover, moisture detectors aid in segregating wet and dry waste, adhering to government protocols.These bins also incorporate various sensors, such as infrared, ultrasonic, or weight-based, to gauge the level of fullness. A conspicuous red LED indicator illuminates when the bin reaches full capacity, signalling the need for emptying. Conversely, the absence of the red LED signifies available space within the bin. Innovative automatic compaction systems compress waste, maximizing bin capacity and reducing the frequency of emptying. When deployed in public spaces, these bins utilize IoT technology to connect with a mobile application, facilitating convenient waste disposal by guiding users to nearby bins with available capacity. The smart trash bin features an automatic garbage packing system.Upon detecting full capacity and the inability to accommodate additional waste, it autonomously seals the garbage in a pre-installed eco-friendly waste disposal bag. This bag, already positioned inside the bin, ensures efficient containment of waste. When removing the waste, users can easily replace the filled bag with a new one, ready to be lined against the inner walls before the next batch of garbage is deposited.

Furthermore, to ensure uninterrupted operation, these bins can be powered by solar cells or conventional electricity supplied by state boards. This blend of cutting-edge features and sustainable power sources marks a significant advancement in waste management infrastructure, enhancing efficiency, promoting cleanliness, and aligning with environmental goals.

DETAILED DESCRIPTION OF THE INVENTION:

1. Automatic opening of the bin: The smart trash can utilizes an ultrasonic sensor (like SONAR) to detect garbage proximity, prompting the servo motor to open the lid when garbage is nearby and closing it otherwise.
2. Smell Sensing: Conventional odour detectors alert users to foul smells, prompting timely disposal.
3. Use of Moisture Detectors:moisture detectors aid in segregating wet and dry waste, adhering to government protocols.
4. Capacity Detection: various sensors, such as infrared, ultrasonic, or weight-based, to gauge the level of fullness. A conspicuous red LED indicator illuminates when the bin reaches full capacity, signalling the need for emptying. Conversely, the absence of the red LED signifies available space within the bin.

Further Advancements (Future Scope):

1. Automatic compaction system: Innovative automatic compaction systems compress waste, maximizing bin capacity and reducing the frequency of emptying.

2. Automatic waste packing: The smart trash bin features an automatic garbage packing system. Upon detecting full capacity and the inability to accommodate additional waste, it autonomously seals the garbage in a pre-installed eco-friendly waste disposal bag. This bag, already positioned inside the bin, ensures efficient containment of waste. When removing the waste, users can easily replace the filled bag with a new one, ready to be lined against the inner walls before the next batch of garbage is deposited.

3. Integration of IOT: When deployed in public spaces, these bins utilize IoT technology to connect with a mobile application, facilitating convenient waste disposal by guiding users to nearby bins with available capacity.

4. Power Management: To ensure uninterrupted operation, these bins can be powered by solar cells or conventional electricity supplied by state boards.

Block Diagram:

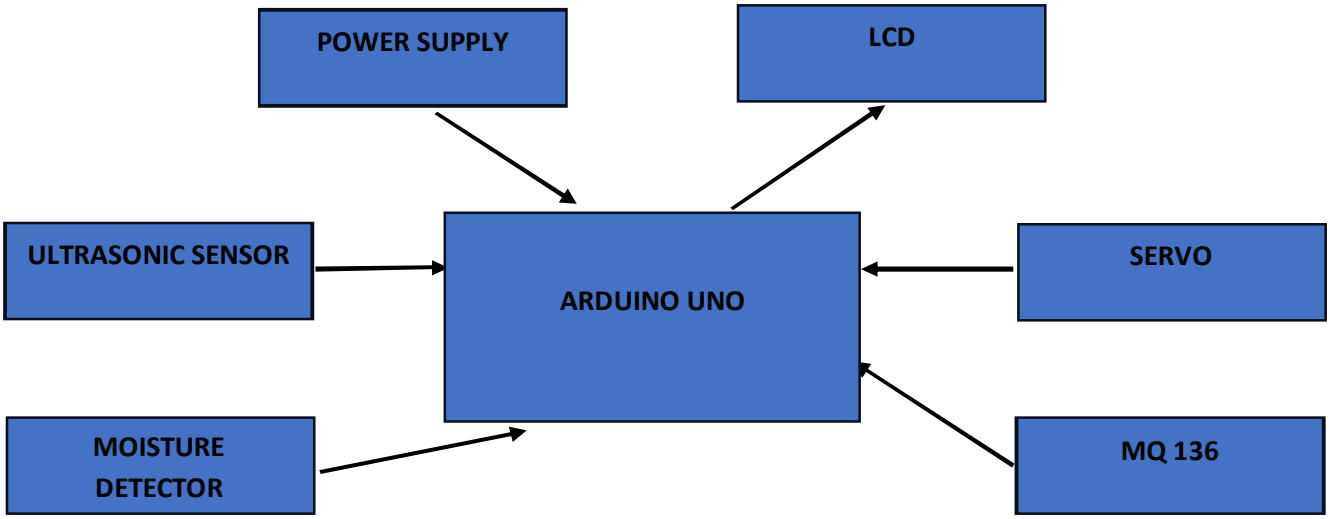

Figure 1: Block Diagram of the Smart Trash Can

Figure 2: Prototype of Our Advanced Waste Disposal Trash Bin

Code:

```
#include <Wire.h>

#include <LiquidCrystal_I2C.h>

#include <Servo.h>   //servo library

#define MQ2pin (A0)
```

```
#define ledPin 6

#define moisturePin A1
float sensorValue;
LiquidCrystal_I2C lcd(0x27, 16, 2);
Servo servo;
int trigPin = 8;
int echoPin = 9;
int servoPin = 7;
long duration, dist, average;
long aver[3];   //array for average
void setup() {
  Serial.begin(9600);
pinMode(ledPin, OUTPUT);
digitalWrite(ledPin, LOW);
lcd.init();
delay(3000);
lcd.backlight();
lcd.setCursor(0, 0);
lcd.print("Calibrating");
delay(3000);

lcd.clear();

   servo.attach(servoPin);

   pinMode(trigPin, OUTPUT);

   pinMode(echoPin, INPUT);

   servo.write(0);        //close cap on power on

   delay(100);

  servo.detach();

}

void measure() {

digitalWrite(trigPin, LOW);

delayMicroseconds(5);

digitalWrite(trigPin, HIGH);

delayMicroseconds(15);

digitalWrite(trigPin, LOW);
```

```
pinMode(echoPin, INPUT);
duration = pulseIn(echoPin, HIGH);
dist = (duration/2) / 29.1;    //obtain distance
}
void gasSense() {
int gasSensor = analogRead(gasPin);
if (gasSensor> 350)
{
lcd.setCursor(0, 0);
lcd.print("Value : ");
lcd.print(gasSensor);
Serial.print(gasSensor);
Serial.print("\t");
lcd.setCursor(0, 1);
Serial.println("Dispose Off Quickly");
lcd.print("Dispose Off Quickly");
delay(300);
lcd.clear();
}
else if (gasSensor< 350)
{
lcd.setCursor(0, 0);
lcd.print("Value : ");
lcd.print(gasSensor);
Serial.print(gasSensor);
Serial.print("\t");
lcd.setCursor(0, 1);
```

```
Serial.println("Gas level is LOW");
lcd.print("Gas level is LOW");
delay(300);
}
}
int readMoistureSensor() {
int moistureValue = analogRead(moisturePin);  // Read the analog value from sensorint
outputValue = map(moistureValue, 0, 1023, 255, 0); // map the 10-bit data to 8-bit data
return outputValue;             // Return analog moisture value
}
void loop {
  for (int i=0;i<=2;i++) {   //average distance
    measure();
   aver[i]=dist;
    delay(10);              //delay between measurements
  }
 dist=(aver[0]+aver[1]+aver[2])/3;

if ( dist<50 ) {
//Change distance as per your need
 servo.attach(servoPin);
  delay(1);
 //delay(3000);
 servo.write(150);
 delay(1350);
 //servo.detach();
 //servo.write(-150);
```

```
}
else
{
  delay(149);
  servo.write(-150);
gasSense();
  if(readMoistureSensor() >150) {
digitalWrite(ledPin, HIGH);
 }
else {
digitalWrite(ledPin, HIGH);
}
}
Serial.println(dist);
}
```

OUTCOME:

When the garbage is brought near, the trash can automatically opens its lid and the garbage is thrown inside. When the trash can is closed the moisture sensor(s) detect whether foul smell due to the release of bio gas from the garbage. If so, the LCD prints,"DisposeOff Quickly". Otherwise, it prints, "Gas Level is Low". The moisture detector detects whether waste is wet or not. If so, the LED glows. Otherwise, the LED is off. Further advancement can be made by incorporating a waste packing system to pack the waste automatically within the trash can once its full. Automatic compaction system compresses the waste to create more space. When deployed in public spaces, these bins utilize IoT technology to connect with a mobile application, facilitating convenient waste disposal by guiding users to nearby bins with available capacity.

Advantages of the Invention:

1. Hygiene Maintenance: Conventional odour-detecting sensors promptly alert users to foul smells, ensuring timely disposal and maintaining hygiene in public spaces as well as in homes.
2. Hands Free Access (Contactless Access): By using SONAR, our smart trashcan features sensor-based opening, enabling touchless operation for convenient disposal, ideal for hands-free access when busy or avoiding contact.
3. Segregation of Wet and Dry Waste: Moisture detectors aid in segregating wet and dry waste, aligning with government protocols and promoting efficient waste sorting practices.

4. Space Optimization: Innovative automatic compaction systems compress waste, maximizing bin capacity and reducing the frequency of emptying. This not only saves space but also reduces operational costs associated with waste collection.
5. Efficient Waste Disposal: Upon reaching full capacity, the smart trash can automatically seals the garbage in a pre-installed eco-friendly bag, ensuring efficient containment. Users can effortlessly replace the filled bag with a new one, eliminating the need to touch the waste during disposal. The efficient packing mechanism securely seals the waste, preventing accidental spillage.
6. Portability: The compact and portable design of the device makes it suitable for use in various settings, including workplace, public space and homes.
7. Connectivity: When deployed in public spaces, these bins utilize IoT technology to connect with a mobile application, facilitating convenient waste disposal by guiding users to nearby bins with available capacity.
8. Efficient Power Management: The dual power source options of solar and conventional electricity guarantee uninterrupted operation, even in areas with limited infrastructure.

CONCLUSION:

In conclusion, our smart trash can represents a groundbreaking advancement in waste management. Through innovative features like advanced sensors, automatic compaction, and IoT connectivity, these bins offer a holistic solution to modern waste disposal challenges.They efficiently detect garbage levels, segregate wet and dry waste, and guide users to nearby bins with available capacity, streamlining waste collection while promoting cleanliness and sustainability. The automatic sealing of garbage in eco-friendly bags ensures hygienic disposal without the need for user contact. Moreover, the dual power source options of solar and conventional electricity guarantee uninterrupted operation, even in areas with limited infrastructure. Overall, these features signify a significant step forward in waste management, enhancing efficiency, cleanliness, and environmental responsibility.As we continue to refine these technologies, smart trash cans promise a brighter future for waste management, contributing to cleaner, more sustainable communities for generations to come.

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