REPORT

ON

FOUR WEEKS OF INTERNSHIP
Carried out on

"IOT BASED SMART DUSTBIN"

Submitted to

DLITHE SOLUTION PVT LTD

In partial fulfillment of the requirements for the award of the

Degree of Bachelor of Engineering

In

ELECTRONICS AND COMMUNICATION ENGINEERING

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Acknowledgement

The internship opportunity we had with DLithe Solution Pvt Ltd was a great chance for learning and professional development. Therefore, we consider ourself as very lucky individuals as we were provided with an opportunity to be a part of it.

Our internship would not have been successful without the encouragement, guidance and support by various personalities. First and foremost, we would like to express our sincere gratitude towards our project guide Mr. Vijay G H for his guidance, encouragement and inspiration throughout the Internship work.

We extend our gratitude to Dr. K. V. S. S. S. S Sairam, Professor and Head, Department of Electronics and Communication Engineering, N. M. A. M. Institute of Technology, Nitte, for his encouragement and providing necessary facilities in the department.

We wish to acknowledge the support of Dr. Niranjan N. Chiplunkar, Principal, N. M. A. M. Institute of Technology, Nitte, for providing motivational academic environment. Finally, we would like to thank all our friends and well-wishers who have helped us whenever needed and supported us.

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ABSTRACT

In the recent decades, urbanization has increased tremendously. At the same phase there is an increase in waste production. Waste management has been a crucial issue to be considered. This proposal is a way to achieve this good cause. In this project smart dustbin is built on a microcontroller-based platform Arduino Uno board which is interfaced with the Servo motor and ultrasonic sensor. Ultrasonic sensor is placed at the top of the dustbin which will measure the stature of the dustbin.

The threshold stature is set at a particular level. Arduino will be programmed in such a way that when someone will come in front of dustbin the servo motor will come in action and open the lid for the person to put the waste material into the dustbin. Once these smart bins are implemented on a large scale, by replacing our traditional bins present today, waste can be managed efficiently as it avoids unnecessary lumping of wastes on roadside. Foul smell from these rotten wastes that remain untreated for a long time, due to negligence of authorities and carelessness of public may lead to long term problems. Breeding of insects and mosquitoes can create nuisance around promoting unclean environment. This may even cause dreadful diseases.

INTRODUCTION

A healthy lifestyle comes from the locations where you live and which is pollution-free. The governments of various countries have taken high-level initiatives to address the issue to waste management. These smart dustbins or containers are particularly useful in big cities. After the invention of innovative trash containers, the workload of municipalities is reduced. A smart dustbin is majorly helping in reducing waste included with waste elimination. This step-by-step waste removal innovation machine is allowing workers to maintain the hygiene of the environment.

The rate increasing population in our country has increasing rapidly and also, we have increase in garbage which have increased environmental issue. Dustbin is a container which collects garbage's or stores items which recyclable or non-recyclable, decompose and non-decompose. They are usually used in homes, office etc, but in case they are full no one is there to clean it and the garbage are spilled out. The surrounding of a dustbin is also conducive for increasing the pollution level. Air pollution due to a dustbin can produce bacteria and virus which can produce life harmful diseases for human. Therefore, we have designed a smart dustbin using Arduino, ultrasonic sensor which will sense the item to be thrown in the dustbin and open the lid with the help of the motor. It is an IOT based project that will bring a new and smart way of cleanliness. It is a decent gadget to make your home clean, due to practically all offspring of home consistently make it grimy and spread litter to a great extent by electronics, rappers and various other things. Since the smart dustbin is additionally intriguing and children make fun with it so it will help to maintain cleanliness in home. It will be applied for various type of waste. Dustbin will open its lid when someone/object is near at some range then it will wait for given time period than it will close automatically. Here lid will close when you don't want to use and it will only open when it required.

METHODOLOGY

SMART DUSTBIN USING ARDUINO is an IOT based project. Here we are using Arduino for code execution, for sensing we used ultrasonic sensor which will open lid and wait for few moments. It will bring drastic changes in tern of cleanliness with the help of technology. Everything is getting with smart technology for the betterment of human being. So, this helps in maintaining the environment clean with the help of technology. It is a sensor-based dustbin so it would be easy to access/use for any age group.

Our aim is also to make it cost effective so that many numbers of people can get the benefit from this. And it should be usable to anyone and helpful for them. To complete our project, we require some software as well as some hardware.

COMPONENTS

Required Software:

1. ARDUINO IDE

Required Hardware:

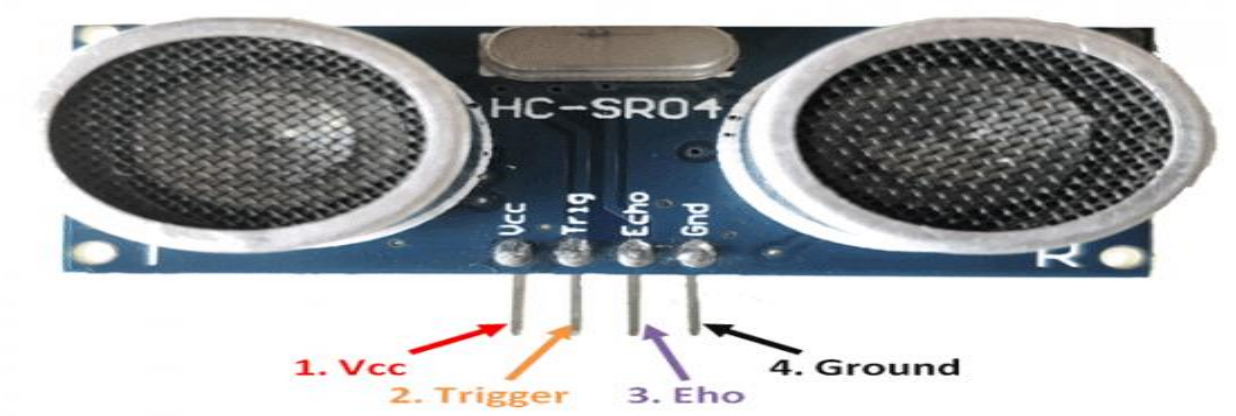
Sl. No	Components
1	Arduino
2	Ultrasonic Sensor
3	Servo Motor
4	Infrared Sensor
5	Cardboard
6	Bucket
7	Connecting Wires
8	LED

Ultrasonic Sensors

Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse. The pin configuration for ultrasonic sensor module which includes

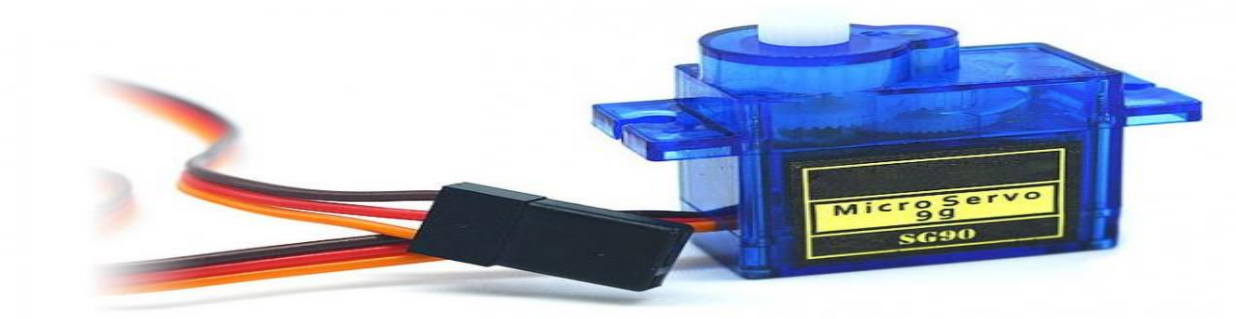
- Vcc (5 volt Supply)
- Trigger pin
- Echo pin

- Gnd (0volt)



Servo Motor

A servo motor is an electrical device which can push or rotate an object with great precision. If you want to rotate an object at some specific angles or distance, then you use servo motor. It is just made up of simple motor which run through servo mechanism. If motor is used is DC powered then it is called DC servo motor, and if it is AC powered motor then it is called AC servo motor. We can get a very high torque servo motor in a small and light weight package. Due to these features, they are being used in many applications like toy cars, RC helicopters and planes, Robotics, Machine etc.



Servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kinds but smaller. We can use any servo code, hardware or library to control these servos.

Infrared Sensor

The IR sensor or infrared sensor is one kind of electronic component, used to detect specific characteristics in its surroundings through emitting or detecting IR radiation. These sensors can also be used to detect or measure the heat of a target and its motion. In many electronic devices, the IR sensor circuit is a very essential module. This kind of sensor is similar to human's visionary senses to detect obstacles.

Arduino

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board — you can simply use a USB cable. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

The Uno is one of the more popular boards in the Arduino family and a great choice for beginners. The Arduino hardware and software was designed for artists, designers, hobbyists, hackers, newbies, and anyone interested in creating interactive objects or environments. Arduino can interact with buttons, LEDs, motors, speakers, GPS units, cameras, the internet, and even your smart-phone or you're TV. This flexibility combined with the fact that the Arduino software is free, the hardware boards are pretty cheap, and both the software and hardware are easy to learn has led to a large community of users who have contributed code and released instructions for a huge variety of Arduino-based projects.

OBJECTIVES

The main objective of this project is to

- Design and build a prototype for an automatic open dustbin that can automatically open the lid when it detects the people who want to throw out their trash. It also can detect the level of the trash that inside the dustbin.
- To get familiar with the Arduino and the respective sensors how to use them for a cause.
- To analysis the dustbin program and set it up according to the physical distance for best Working.

CONNECTIONS

- **Servo Motor SG-90**
  1. Red Pin (Servo Motor) with Arduino 5v
  2. Black Pin (Servo Motor) with Arduino GND (Ground)
  3. Orange Pin (Servo Motor) with Arduino Pin 5

- **Ultrasonic Sensor**
  1. VCC (Sensor) with Arduino 5v
  2. Trig (Sensor) with Arduino Pin 10
  3. Echo (Sensor) with Arduino Pin 11
  4. GND (Sensor) with Arduino GND

- **IR Sensor**
  1. IR Pin(Sensor) with Arduino Pin 8
  2. Redled with Arduino Pin 6
  3. Greenled with Arduino Pin 7

Arduino Code

Code For Servo Motor and Ultrasonic Sensors

servoworking.ino

```
#include <ESP32Servo.h>
const int TRIG_PIN  = 10;  // Arduino pin connected to Ultrasonic Sensor's TRIG pin
const int ECHO_PIN  = 11;  // Arduino pin connected to Ultrasonic Sensor's ECHO pin
const int SERVO_PIN = 5; // Arduino pin connected to Servo Motor's pin
const int DISTANCE_THRESHOLD = 25; // centimeters
Servo servo; // create servo object to control a servo
// variables will change:
float duration_us, distance_cm;
void setup() {
  Serial.begin (9600);       // initialize serial port
  pinMode(TRIG_PIN, OUTPUT); // set arduino pin to output mode
  pinMode(ECHO_PIN, INPUT);  // set arduino pin to input mode
  servo.attach(SERVO_PIN);   // attaches the servo on pin 9 to the servo object
  servo.write(0);
}
void loop() {
  digitalWrite(TRIG_PIN, HIGH);
  delayMicroseconds(10);
  digitalWrite(TRIG_PIN, LOW);
duration_us = pulseIn(ECHO_PIN, HIGH);
  distance_cm = 0.017 * duration_us;
if(distance_cm < DISTANCE_THRESHOLD)
    servo.write(0); // rotate servo motor to 90 degree
  else
    servo.write(90);  // rotate servo motor to 0 degree
  Serial.print("distance: ");
  Serial.print(distance_cm);
  Serial.println(" cm");

  delay(1000);
}
```

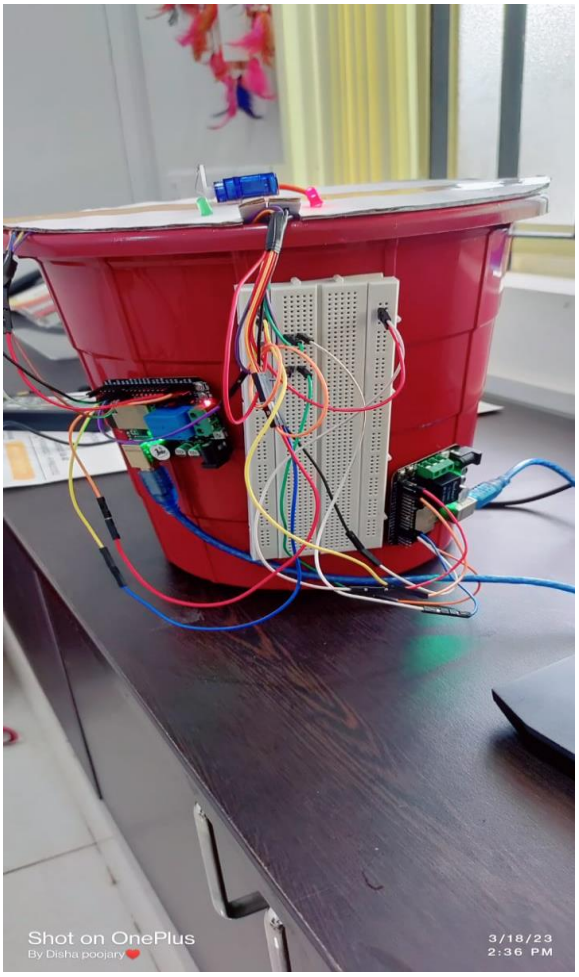
Code for IR Sensor

Ultrasonic_Led.ino

```
int IR_Pin = 8; // Connect the IR sensor to pin 5
int redLEDPin =6 ; // Connect the red LED to pin 10
int greenLEDPin = 7; // Connect the green LED to pin 11// Connect the yellow LED to pin 12

void setup() {
  Serial.begin(9600);
  pinMode(IR_Pin, INPUT);
  pinMode(redLEDPin, OUTPUT);
  pinMode(greenLEDPin, OUTPUT);
}

void loop() {

int IR_Level = digitalRead(IR_Pin);
  if (IR_Level == LOW) {
    digitalWrite(redLEDPin, HIGH);
    digitalWrite(greenLEDPin, LOW);
  } n
  else if (IR_Level == HIGH) {
    digitalWrite(redLEDPin, LOW);
    digitalWrite(greenLEDPin, HIGH);
  }


}

```

Working

After wiring and attaching all the devices and setting up to the Smart Dustbin, now observe all the important setup whether they are well connected or something missed. After connection set up now next step is to submit/upload code in Arduino and supply power to the circuit. When system is powered ON, Arduino keeps monitoring for any things that come near the sensor at give range. When Ultrasonic sensor detect any object for example like hand or others, here Arduino calculates its distance and if it less than a certain predefines value than servo motor get activate first and with the support of the extended arm of the lid. Lid will open for a given time than it will automatically close. If the dustbin is not full green led will glow and I the dustbin is full red light will glow.



ADVANTAGES

A smart dustbin helps in the development of countries, places and regions. The city will become smarter if they are full of the smart bin. It is a cost-effective and eco-friendly solution that allows you to collect and reduce waste effectively. There are some benefits of using a smart bin. Following are the advantages of using Smart dustbin

- A reduction in the number of waste collections needed by up to 80%, resulting in less manpower, emissions, fuel use and traffic congestion.
- A reduction in the number of waste bins needed.
- Maintain environment hygiene (i.e., no overflowing of waste and less unpleasant odor).
- It will help in bringing evolution by technology in term of cleanliness.
- The smart bin ensures collection only when the container is full. It reduces your efforts and time too.
- Truck collection visits enhance traffic and gamming, on the other hand, the smart trash container interrupts traffic and makes the street even cleaner.
- Few smart bins come with a Wi-Fi facility, as a result of, increase in hotspot coverage for the public.
- This smart move improves street hygiene and safety.
- They also encourage recycling and reusability.
- This trash analysed data of specific areas through waste volumes. This will help to do better planning to reduce and eliminate wastage from malls, parks, airports and other places.
- It is very significant to track waste container occupancy rate. For effective waste management the data provided in smart bins by smart sensors are very crucial. With smart sensors notify the owners of smart bins they provide the data of which waste bin should be collected. And it ensures a reduction in your waste collection costs. It is very beneficial for your business.
- Also, another benefit of smart bins is that the service quality of your business's waste management will improve. You can manage your time in waste management processes. And also, you can control all the process of your waste management and your waste truck operations by your phone easily

CONCLUSION

A simple but useful project called Smart Dustbin using Arduino is designed and developed here. Using this project, the lid of the dustbin stays closed, so that the waste is not exposed to avoid flies and mosquitoes and when you want dispose ant waste, it will automatically open the lid.

Here we are going to make an evolution change toward cleanliness. The combination of intelligent waste monitoring and trash compaction technologies, smart dustbins are better and shoulders above traditional garbage dustbin. It is equipped with smart devices like sensor Arduino etc. Lid of the dustbin will automatically open when an object comes near to the dustbin and after certain time period it will close the lid.

For social it will help toward health and hygiene, for business for we try to make it affordable to many as many possible. So that normal people to rich people can take benefit from it. Believe this will bring something changes in term of cleanliness as well technology. So our next work will be adding one more sensor which will sense whether our dustbin is full or not. And there will be a display will be added so that user can notify that dustbin is full or not.

To conclude this ultimate guide, it is important to highlight municipal waste management issues and its solutions. As the cities are getting more crowded the waste problem is also increasing. And the waste disposal becomes an important issue for municipalities. At that point, utilizing smart bins will be very beneficial for municipalities. The authorized people of the municipality on the issue of waste management can easily and clearly have communication with the driver in charge of their waste truck, and also with smart bin technology the waste truck driver can use the most optimized route so that none of the source of the municipality will be consumed.

Moreover, as the United Nation and all environmental institutions emphasize on the matter of smart cities, the smart bins are the necessary and most effective solution for municipalities. Thanks to smart bin technology in municipalities it is possible to create smart cities that aim for a more green and sustainable future for us.

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