DEPARTMENT OF COMPUTER SCIENCE ENGINEERING,
SCHOOL OF ENGINEERING AND TECHNOLOGY,
SHARDA UNIVERSITY, GREATER NOIDA

AUTOMATIC CLEAN OUT CORNER

A project submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Technology in Computer Science and Engineering

by

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May, 2022

CERTIFICATE

This is to certify that the report entitled “Automatic Clean Out Corner” submitted by “Aditi Chandra (2018002388), Nikit Bansal (2018005038), Jitin Kumar Singh (2018015527), Aniket Kulshreshtha (2018008832), Shivam Sharma (2018004547)” to Sharda University, towards the fulfillment of requirements of the degree of Bachelor of Technology is record of bonafide final year Project work carried out by him/her in the Department of Computer Science and Engineering, School of Engineering and Technology, Sharda University. The results/findings contained in this Project have not been submitted in part or full to any other University/Institute for award of any other Degree.

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ABSTRACT

"Waste" is the whole that no longer has a utilization or intention and should be discarded, legitimate? right. Squander are unwanted or unusable substances. Squander creation infers the utilization of material and energy prompting the the consumption of the Earth's sustainable and non-inexhaustible resources. Squander is any substance that's disposed of after number one use, or is worthless, flawed and of no utilization. A side project by appraisal is a joint made of very minor financial worth

Squander the board is perhaps the most serious issue in the world.People don't know how to isolate and peparate squander Squander isolation is a basic technique for lessening the measure of waste unloaded into our landfills. The earth isn't a landfill. Unloading off squander has enormous ecological effects and may reason serious issues. Some waste will at long last spoil, yet not all, and inside the technique it might scent, or create methane gas, that\'s hazardous and adds to the nursery sway. Leachate delivered as waste decays may also reason contamination. Contamination is a genuine and regularly alarming issue. Contamination increments with the increment in populace. Trash ought to be arranged off appropriately to stay away from tainting..

Methods like recycle, animal feed, biological reprocessing, landfill etc. find it difficult to manage the volume of solid waste generated by urban sprawl. In this study, proposed work comprises of very clean, inexpensive system that uses artificial intelligence to detect garbage.

Finally, a robotic arm controlled by a microcontroller is used to pick up trash and put it in a bin. In conclusion, this study describes a system that can function as an individual in terms of waste collection and segregation.

ACKNOWLEDGEMENT

A major project is a golden opportunity for learning and self-development. We consider our self very lucky and honored to have so many wonderful people lead us through in completion of this project.

First and foremost we would like to thank Dr. Nitin Rakesh, HOD, CSE who gave us an opportunity to undertake this project.

My grateful thanks to Mr. Sudeep Varshney for his guidance in my project work. Mr. Sudeep Varshney, who in spite of being extraordinarily busy with academics, took time out to hear, guide and keep us on the correct path. We do not know where we would have been without his help.

CSE department monitored our progress and arranged all facilities to make life easier. We choose this moment to acknowledge their contribution gratefully.

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INTRODUCTION

Dustbins (also known as trash cans, garbage cans, or trash cans) are tiny plastic (or metal) receptacles used to temporarily store rubbish (or trash). They are frequently used to collect garbage in homes, workplaces, streets, and parks, among other places. Garbage disposal is illegal in certain regions, therefore garbage cans are the only option. It is usual practise to collect moist and dry garbage, which can be recycled or not digested, in various containers.

The project used an Arduino, ultrasonic sensor, and servomotor to develop a system called a smart trash can that automatically opens the trash can door when a human hand is received. Smart Trash Can is a carefully designed solution to solve the social problem of garbage disposal. The smart bin trash can identify the type of item that has been thrown in and classify it as bio or non-perishable. The world is declining, but there is another problem that needs to be addressed. garbage! The image of the trash can is overflowing, and the trash thrown into the trash can is everywhere. This leads to a variety of diseases, as many insects and mosquitoes' breed. Waste management is a major challenge for cities. Therefore, Smart Trash is a system that can eliminate or at least minimize this problem. Our current Prime Minister of India, Sri Narendra Modi ji, has presented the idea of using India's 100 smart cities. Clean India Mission was founded in order to make the environment clean. Most bacteria and bacterial infectious diseases grow in contaminated environments [5]. Currently, environmental protection by technical means is required. Most of the public spaces appear to be contaminated with garbage. Therefore, it is necessary to develop restaurants by transferring intelligent technology. The amount of waste is basically determined by two factors. One is the number of people in the area, and the other is the consumption pattern. Japan's population is growing rapidly, and the increase in waste is also exacerbating environmental problems. Recycle bins are containers used to collect waste and store fresh and non-recyclable, fresh and non-recyclable materials. It is usually used in homes and offices, but when it is full, it is not cleaned and there is no dust. The area around the garbage can also contribute to the increase in pollution. Air pollution by house dust mites can produce bacteria and viruses that can cause illnesses that are harmful to human health. Therefore, we made a smart trash can using the ultrasonic sensor "ARDUINO UNO" that detects that an object has been thrown into the trash can and opens the lid with a motor. A unique and smarter way of cleaning our society can be adopted using our IoT based

project. Keeping your home clean is a decent gadget, as almost every household member constantly messes up your home and throws away trash with electronics, wrappers, and a variety of other items. Since the smart trash can is also a fun and interesting item for young children, it will help keep the house clean. The trash can will open the lid when someone/thing is within a certain distance and wait for a certain amount of time, not automatically closing it. Here the lid will close if you do not want to use it and open only when needed.

1.1 MOTIVATION

It seems that everyone is talking about using Smarter Cities these days. And there's a good reason. Everyone wants smoother, safer and energy efficient traffic. Smart technology has provided answers to these problems. But we're still scratching the surface of something possible.

The new smart trash bins include cloud-based software and the latest Internet of Things (IoT) sensors to detect bin status at all times and alert the waste management of overflowing bins. Using this smart trash can can prevent long-term landfills, thereby preventing disease from spreading on a large scale, and promising a healthy urban environment. The importance of the proposed model to keep our environment clean by avoiding improper collection and disposal, improper waste disposal and dust dumping in public places. The proposed model is fully automated, so there is no need for staff to collect and sort waste in a neglected area. The movement of the proposed model is also fully automated using a robotic fan chain. In this proposed model, the trash can is completely closed, so there is no littering on the road during the move. The proposed model uses ultrasonic sensor and PIR sensor to detect human presence, if it is within the defined sensor range before and after human presence detection, the above of the recycle bin will open automatically. Therefore, it is very helpful for people with disabilities to put trash in the trash can and avoid dust spilling in public places.

The recommended SMART Recycle Bin is used to retrieve the below mentioned purposes:

- Keeping our environment clean and green.
- Reduced workforce.
- Reducing the consumption of time.

• Prevent trash from overflowing

1.2 OVERVIEW

The foremost goal of our project is to design a Smart Dustbin that will be helping our environment to remain clean and eco-friendly. This is inspired by the quest Swatch Bharat. Technology is becoming more and more complex these days, so cleaning up our environment creates a smart trash bin using Arduino. This intelligent waste management system is integrated into a microcontroller-based system with ultrasonic sensors in the bin. If left unchecked, they can harm the environment and contaminate the environment around us. With the proposed technology, we designed a smart dustbin using the Arduino Uno Board, as well as an ultrasonic sensor, a servo motor and a starter battery. After all the hardware and software communication, the Smart Trash system is coming soon. The trash can lid will work when someone approaches it from afar, instead of waiting for the user to take the trash out and close it. Socially it will help with health and hygiene, businesses as we strive to make it accessible to as many people as possible. So that ordinary rich people can enjoy it.

1.3 EXPECTED OUTCOME:

The chief goal of making our project is to reduce manual efforts and to develop a smart city vision. We often see garbage overflowing from trash cans on the street and this is a problem that needs immediate attention. The proverb “Clean is near God and a clean city is close to heaven” has inspired us to reflect on this work. A smart trash can help us reduce pollution. Most of the time, the trash can overflow and many animals such as dogs or mice enter or get close to the trash can. This creates a tragic event. In addition, some birds even try to get rid of debris in the trash. Using this project we can avoid the above mentioned situations. The messages can be sent directly to the mover instead of the admin’s office. Swatch Bharat Abhiyan (also known as Clean India Mission in English) is a national campaign by the Government of India, comprising 4,041 official towns and villages, to clean the roads. roads, roads and national infrastructure. In our system, smart bins are linked to the Internet to receive live information about smart bins. In current years, rapid population growth leads to dumping

of waste. Therefore, a proper waste management system is needed to prevent the spread of other deadly diseases.

1.4 GANTT CHART

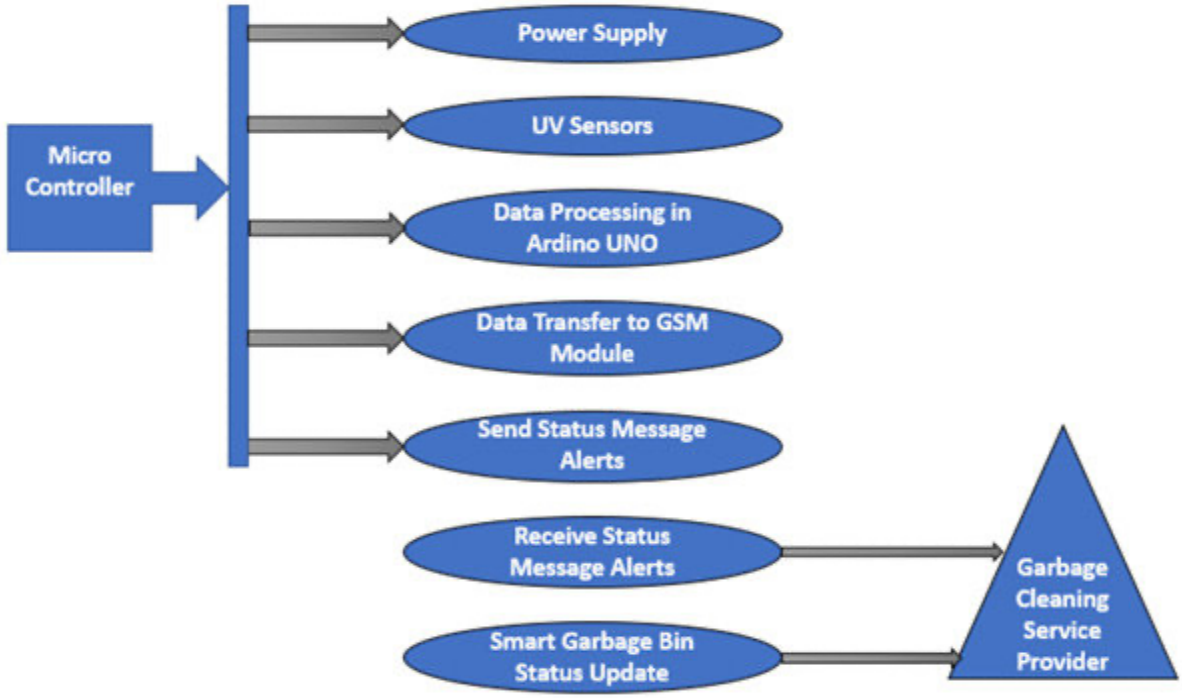


Fig. 1: The Gantt chart shows the workflow of the bin

1.5 POSSIBLE RISKS OF SMART BINS

The risks or disadvantages of Smart Waste Management are mentioned below:

- Our society requires more bins for separate waste collection depending on the population of a particular city. This leads to high upfront costs due to the expensive price of smart trash compared to other methodologies.
- The sensor nodes which are used in the bucket have a very less memory size.
- The wireless technologies that are used in the system such as ZigBee and Wi-Fi have shorter range and lower data rates. In RFID based systems, the RFID tag is influenced by surrounding metal objects (if any).

- Smart Waste Management System decreases the need of labor, leading to the rise in the unemployment rate of the unskilled.
- Need to organize training for people involved in smart waste management system.
- Truck routes are not optimized; truck routes are not optimized resulting in excessive fuel consumption. In addition, some bins may be full and others may be filled. Containers that are too full cause environmental pollution and are of poor quality.
- The only part of the solution is to use smart technology and recycling of garbage. The other party ensures that the waste is disposed of properly and that the recyclable waste is disposed of properly. The method of disposing of waste in the areas she created is common, meaning that all waste goes into one bin, so the filtering function belongs to the waste management company. The filtering method is widely used in practice, so the processing is very slow. However, an automated product lifecycle tracking system can simplify the used product renewal process. Technical information about a product, including the source material, the correct recycling method, among other things, can greatly improve the recycling process and make it more expensive.

1.6 SRS

Some of the functional requirements are as follows:

- ✓ Read the readings of sensor from sensor circuit
- ✓ Computing those readings and taking action onto them.
- ✓ Sending information to the garbage collector for collection of waste
  For example: Collect garbage from bins whose level is over 90% of bin.
- ✓ A client-side script to get dustbin's current Geolocation.

Some of the requirements which are non-functional are as follows:

- ✓ The project requires a user interface to monitor and manually intervene (if necessary) in efficient and timely garbage collection from selected bins.
- ✓ Another user interface contains the information about the truck drivers who are supposed to collect the garbage.

Hardware components used in these modules are as follows:

- ✓ ESP 8266 NodeMCU module
- ✓ Rechargeable Battery

- ✓ Ultrasonic Sensors
- ✓ Logic Level Converter (Voltage Divider)
- ✓ Neo GPS 6M module

The least computer requirements are as follows:

- ✓ 2GB RAM
- ✓ Dual Core, intel i3 processor
- ✓ Windows 8 or later version.

Minimum requirements of software are as follows:

- ✓ MERN Stack
- ✓ Blynk App
- ✓ Arduino IDE

CHAPTER 2

METHODOLOGY

The automatic trash bin automation is done with power consumption, the microcontroller, the APR module, the PIR sensor, the servo engine and the ultrasonic sensor are totally customized utilizing the Arduino IDE. A ultrasonic sensor is an instrument that actions the distance of an item utilizing sound waves.It is viable to degree the gap among the sensor and the item by means of recording the time elapsed among the energetic audio radio and the reverse sound wave. In other words, the sensor head emits ultrasonic waves and receives the waves returned by the lens.

The module which provides a standalone SOC with TCP/IP convention stack remembered for it and can give any microcontroller admittance to our Wi-Fi people group is called Wi-Fi module. It can have applications or download all Wi-Fi people group sports from another product processor. Each ESP8266 module comes preconfigured with AT order set firmware, that is to say, it can surely be associated with an Arduino gadget and can recover as much Wi-Fi abilities as is provided through the Wi-Fi Shield. The mod is an inexpensive map with a large and constantly growing community. It upholds APSD for VoIP applications and Bluetooth co-stream interface, contains restricted RF permitting it to work under every working condition and requires no outside RF additive. They find out if a person has entered sensory diversity. They are mostly used in homes or businesses and are found in electrical and utility equipment. They are often known as "passive infrared", "motion infrared", or "thermoelectric" sensors.

PIR sensors are absolutely easy to connect with a microcontroller. It works like digital output so all we have to do is concentrate to the pin whether or not it is turn (high) (or now not to be had). The infrared (IR) sensor is a tool which gives electronic output and detects other environmental functions. The IR sensor can discover object temperature and motion. Whenever an IR sensor detects an object close to it, the mild from the LED returns from the item to the light object. Usually all gadgets are illuminated in some manner by way of the new rays in the infrared spectrum. These invisible kinds of radiation in our eyes can be detected with the aid of an infrared sensor. The IR LED (Light Emitting Diode) is truely emitterand the IR photodiode is actually a sensor of the IR light of the same length emitted by the IR LED. Ionic

is a entire open SDK for hybrid cellular app improvement. The trendy launch, referred to as Ionic three or really "Ionic", is built in Angular.

Provides all the essential equipment and services for developing hybrid cellular programs the use of Web technologies such as CSS, HTML5, and Sass.

Apps can easily be constructed with this Web technology and can be dispensed to standard app shops and may be hooked up on gadgets the usage of the language. Ionic gives all the functionality to be had inside the native mobile smartphone SDKs. Users can truly build their very own apps, customise them with Android or iOS, and use the language. Ionic also consists of cellular capabilities, typography, interactive paradigms, and a primary simple subject

In this work, ROBOT can be built with DC motor and motor driver. The ROBOT will encounter the presence of particles on the conveyor using an IR sensor. Then, the clamp will pick up trash, and in the clamp three types of sensors, namely inductive sensor, photoelectric proximity sensor and magnetic cylinder sensor will be used. Soil moisture sensors are used to locate dry or wet waste. When the sensors detect waste, the bin placed in the vehicle will pass just fine. ARM will get rid of waste in the proper bin phase. The GSM module used right here to send a more in-depth look to the applicable authorities whilst the break up is over even if the barrel is completely full.

This is the literature review of some of the research work which we did in order to get an idea about the advantages and disadvantages of the existing work:

ADVANTAGES	DISADVANTAGES	RESEARCH WORK
Real time data at the fill stage of the dustbin.	Time ingesting and much less effective: vans go and empty packing containers whether or not they may be complete or not.	https://arxiv.org/ftp/arxiv/papers/1904/1904.13034.pdf
Cost Reduction and resource optimization.	High costs.	https://arxiv.org/ftp/arxiv/papers/1908/1908.05849.pdf
Improves Environment quality -Fewer smells -Cleaner cities	Unhygienic Environment and appearance of the city.	https://www.technoarete.org/common_abstract/pdf/IJSEM/v7/i1/Ext_03468.pdf

Intelligent management of the services in the city.	Bad smell spreads and may cause illness to human beings.	https://techxplore.com/news/2019-08-automatically-garbage.html
Effective usage of dustbins.	More traffic and Noise.	https://www.golectures.com/index.php?go=search&yti=G7XjSHoNDQ8
Deployment of dustbin primarily based totally at the actual needs.	Dustbin locations are not pre-planned.	https://www.ijert.org/research/smart-trash-collecting-and-segregating-robot-IJERTV9IS110152.pdf

2.1 PRODUCT/ SYSTEM VIEW

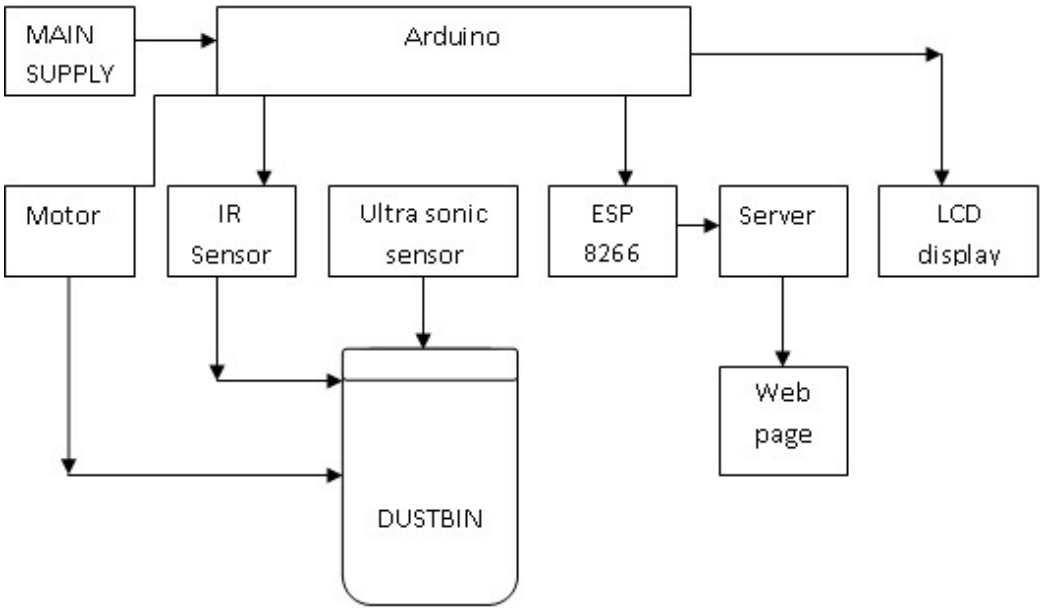


Fig 2: Diagram representation of the proposed system

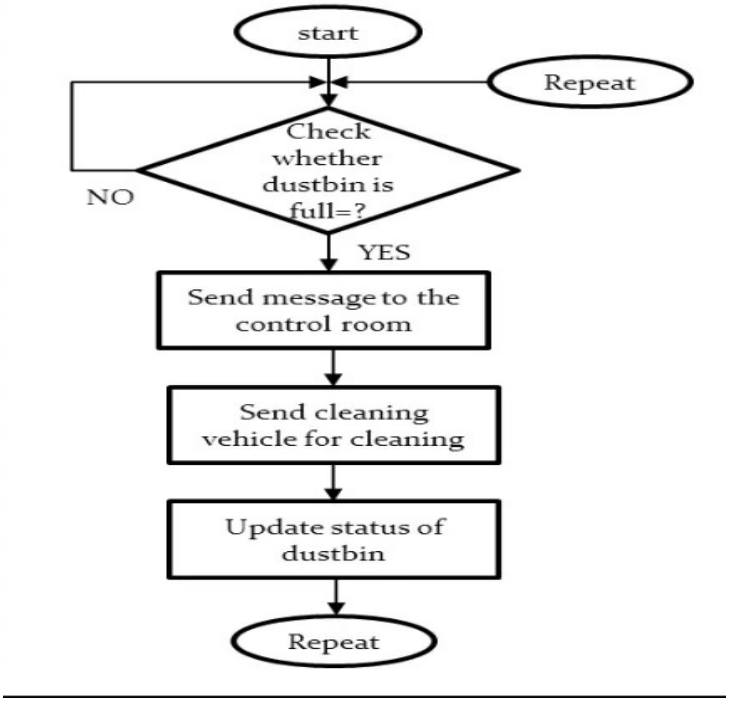


Fig 3: Flowchart of Vehicle Tracking System

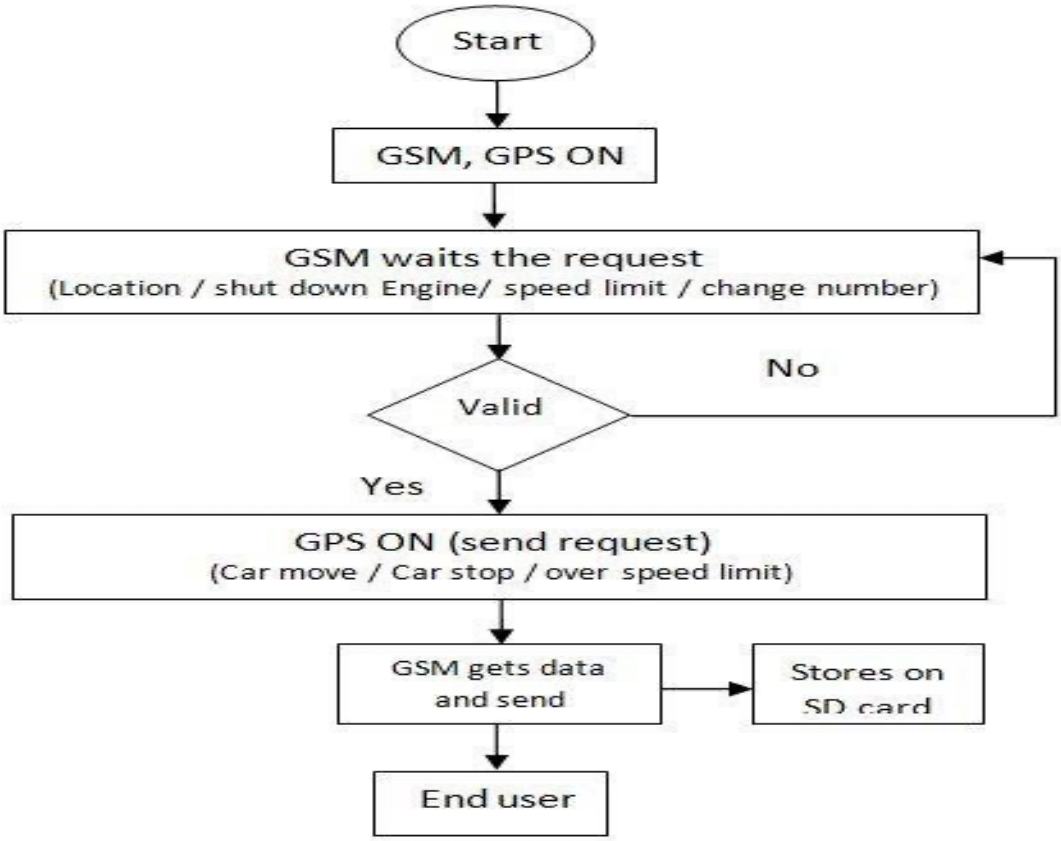


Fig 4: Flowchart of GPS and GPRS working modules

2.2 SYSTEM COMPONENTS & FUNCTIONALITIES

Features of Automatic Clean-out Corner are as follows:

- **Ultrasonic Level Sensors -** The smart Ultrasonic Level Sensors installed inside the shrewd canister recognizes the fill-level of receptacles and send information to the cloud-based observing and information investigation stage. Ongoing checking of waste level with the guide of sensors and remote correspondence abilities.

- **Zero Touch Functionality -** Automatic Clean-out Corner is embedded with Infrared Sensors. Once someone tries to throw the garbage, it will detect it and open and closed the led of the bin without any physical touch.

- **Waste Segregation Arm –** Our segregation arm is built in a way such that it will take the waste from the person and also segregate the waste as dry and wet waste. It will ensure to maintain Zero Touch policy and also the type of waste.

- **Fill Level Control -** Communication module (allows you to send notifications whenever the container is fit to be discharged or in the event of a problem). These incorporate IoT-empowered sensors that go about as ongoing pointers to decide whether canisters are full and assist with tweaking waste assortment plans likewise.

- **Display Monitor -** Display Monitor displays fill level of the dustbin, the Red light indicates that the dustbin is full and the user can't use the dustbin until is being emptied by the authorities.

2.3 DATA & RELATIONAL VIEWS

Hardwares Required

- **Arduino Uno Board -** The microcontroller board which depends on the ATmega328P (datasheet) is the Arduino/Genuino Board. It contains 14 advanced input/yield pins (6 of them can be utilized as PWM yields), 6 simple sources of info, 16 MHz quartz precious stone, USB association, power attachment, standard ICSP header and reset button. The board comprises of everything expected to help the microcontroller. We can absolutely get everything rolling by associating the Arduino Uno board to a PC with a USB link or power it with an AC to DC connector or battery.

- **SIM 800L GSM Module -** is an equipment gadget which utilizes GSM cell phone innovation and gives an information connect to a remote organization. They are basically indistinguishable from a conventional cell phone from the perspective on the cell phone organization, including the requirement for a SIM to distinguish themselves to the organization.

- **NEO GPS 6M -** This module is a well-performing total GPRS beneficiary with an inherent fired recieving wire of aspects 25 x 25 x 4 mm. It gives a solid satellite pursuit capacity. We can screen the situation with the module with the power and sign pointers.

- **Servo Motor -** A servo engine is a straight or rotational actuator that gives exact control of direct or rakish position, speed increase, and speed. It comprises of an engine combined with a position input sensor.

- **ESP 8266 Wifi Module -** Arduino Uno WiFi is an Arduino Uno with an implicit WiFi module. Board in view of ATmega328P with worked in ESP8266WiFi module. The ESP8266WiFi module is an independent SoC with an underlying TCP/IP convention stack that can give admittance to our WiFi organization (or the gadget can go about as a passageway).

- **Display Monitor -** A presentation screen is an electronic gadget used to show video yield from a PC. Show screens are utilized in an assortment of registering gadgets, from

PCs (PCs) and workstations to little convenient gadgets, for example, mobile phones and MP3 players.

- **Jumper Wires -** A jumper wire is an electrical transmitter, or gathering of wires in a link, with a connector or pin at each end regularly used to interface parts of a circuit board or other model.

- **Infrared Sensors -** An infrared sensor is an electronic gadget that actions the distance to an objective item by producing infrared waves and changing over the reflected sound into an electrical sign.

- **Rechargable Batteries -** A battery is a gadget that stores substance energy and converts it into electrical energy. Compound responses in batteries include the progression of electrons from one material (cathode) to another, through an outside circuit.Garbage Container - For collecting the garbage and make the setup

- **Laminated Cardboard -** Laminated Cardboard to make the waste segregation arm.

Softwares Required

- **Arduino Software -** The Arduino open source programming (IDE) makes it simple to compose code and transfer it to the board. This product can be utilized with any Arduino board.

- **MERN Stack -** For creating the application on which the whole data will be collected from Automatic Clean-out Corner.

CHAPTER 3

DESIGN CRITERIA

The technique utilized in this study is to utilize the Waterfall advancement model. The cascade model is a top-to-bottom flow model with many stages that must go through many stages to be successful in computer software development. All stages have to be passed impeccably, individually must be finished and afterward next stage is done, cascade is of severe nature and should be in order.

The periods of the Waterfall model incorporate prerequisites investigation, plan, execution and unit testing, framework combination and testing, and support.

- The necessities investigation stage incorporates diving into the arising issues that should be tackled, or at least, the gathering of trash, the feeling of placing waste perfectly positioned, decreasing apathy to discard trash and the shortfall of robotized gear. like shrewd garbage bins on the table and toward the side of the room.
- The plan stage incorporates planning a sketch picture and a framework test to act as a kind of perspective for the size of the shrewd garbage can, trailed by the plan of the brilliant receptacle, as well as the electrical portrayal.
- The execution and unit testing stages will quite often be alluded to as programming/coding stuff done on the Arduino IDE programming to be utilized with the Arduino programming language, then, at that point, the code is imported Arduino.
- The subsequent stage is framework coordination and testing, explicitly approaching coding testing, in particular testing individually before generally and incorporation testing.
- At long last, the support stage incorporates the brilliant garbage care process by putting it in the right position, limiting undesirable factors that can harm the shrewd garbage bin.

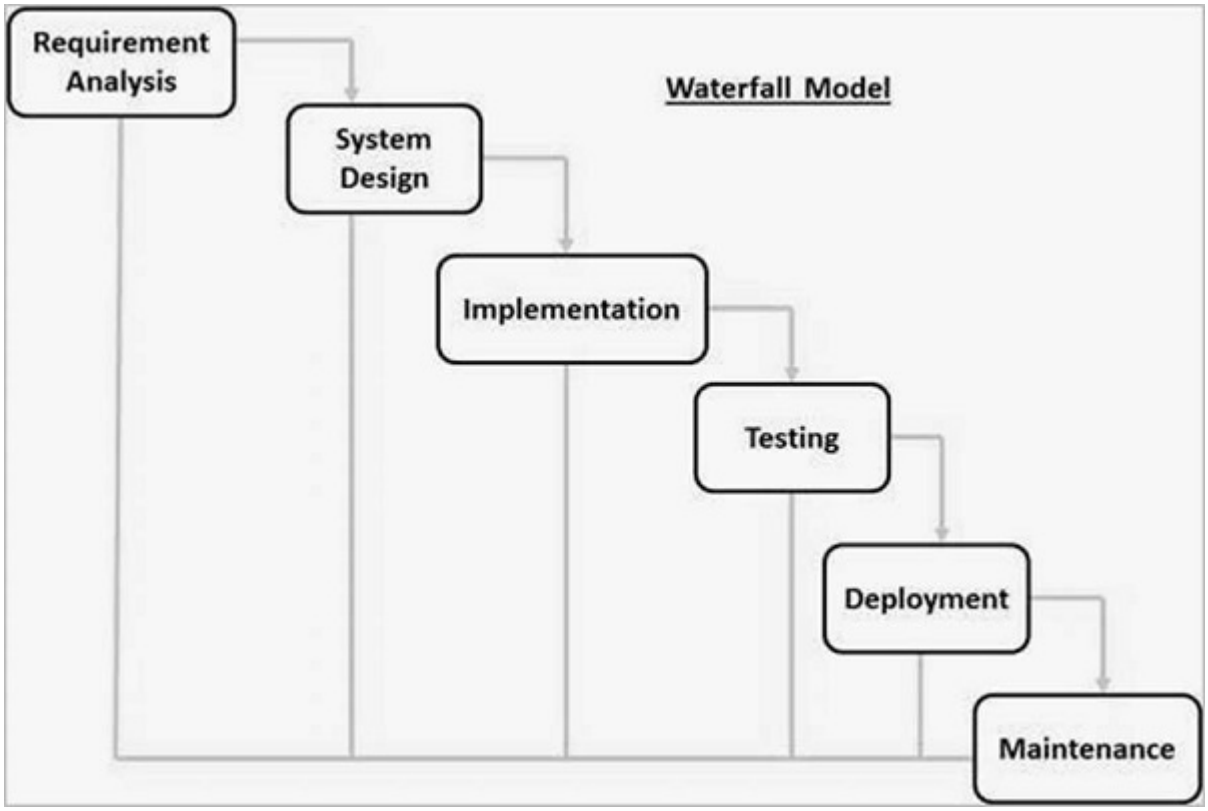


Fig 5: Steps to follow in WaterFall Model

Then for the information assortment methods performed in this study include:

(1) Perception, for example gathering information straightforwardly by observation, recording, then collapsing and then presenting it methodicallly to depict the subject being studied.

(2) Individual meeting is the best instrument to gather data. In this review, information was gathered by seeking clarification on pressing issues and noting verbally straightforwardly to the applicable source.

(3) The writing survey, notwithstanding perceptions and meetings, gathers reference information connected with shrewd garbage bin configuration through books, logical articles in significant diaries and conferences.

(4) The survey as an information assortment device is utilized to test the client's insight in the execution of savvy rubbish, this questionnaire is used to know the impacts generated and possible problem solving degree.

3.1 SYSTEM DESIGN

System Design Overview tells us about smart trash system design with Arduino microcontroller and ultrasonic sensor. It includes two plans, to be specific equipment configuration including gadget plan and programming configuration including Arduino source code.

3.2 DESIGN DIAGRAMS

OPENING THE LID OF OUR SMART DUSTBIN

The main input or signal that needs to be processed is obtained in the form of infrared light which is not visible to naked eyes. This signal is obtained from IR transmitter. Then it reflects back after it incidents on a reflecting surface. The reflected light is then sensed by the IR receiver. Here the IR receiver is reverse biased as it working is in reverse biased region. Well both the receiver and emitter and connected in parallel an output is taken from the receiver end connected in series with a resistor. The IR light doesn't travel much distance and is affected by other lights too. As black objects absorb light so material that is strike on also determines it working. The photo receiver receives the light which is observed by change in potential difference. The distance of reflection is inversely proportional to the voltage drop from the receiver. So when the object comes nearer to the sensor then it gives more voltage drop and so is true for the reverse case.

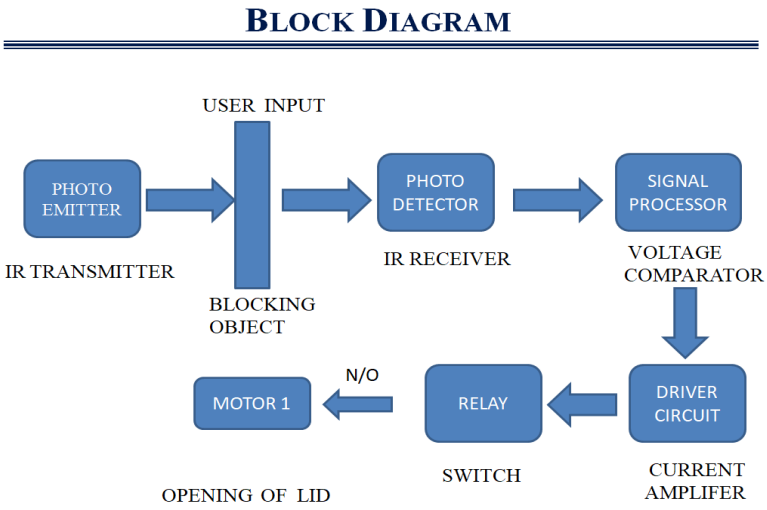


Fig 6: Lid Opening of Dustbin

Now there is signal processing in which operational amplifier is used as voltage comparator. The signal coming from the receiver is now compared with the voltage of potentiometer.

After processing signal, the driver circuit is implemented. The relay is then connected to motor. There is mechanical system which controls the closing of the lid. So, in this way when the smart dustbin detects obstacle then its cover is opened and when obstacle is moved away then its cover is again closed.

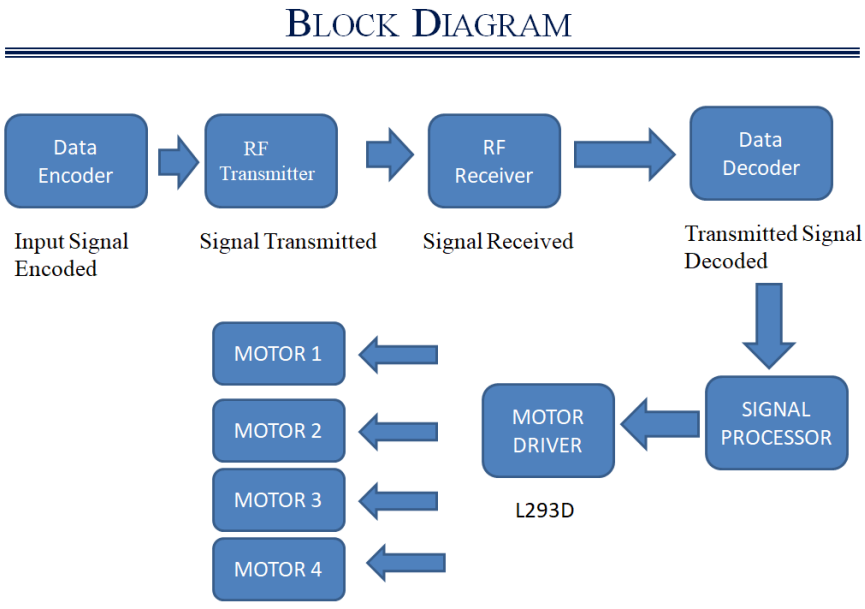


Fig 7: Controlling mobility of the Bin

3.3 SYSTEM ARCHITECTURE

1. Dustbin Layer This layer comprises of Internet and Wifi empowered dustbins. Each dustbin contains the sensor which detects the top off status of dustbin and sends information to the server.

2. Server Layer: It gathers the top off status and area of dustbins. It processes client demands and answers with the area of the closest garbage bin.

3. Client class: the client's request for the closest location of its activated recycle bin to the server using the site.

3.4 INFORMATION AND COMMUNICATION DESIGN

Information and Communication designs are the containers which are made with a smart framework that utilizes sensors, picture acknowledgment and computerized reasoning to get data about how much waste it gets, the kinds of waste and send this information.

The sensors are IoT empowered and furthermore report progressively whether the receptacles are full, simplifying the waste collection program.

Some of the features of our Smart Dustbin model are as follows:

- A correspondence module that sends warnings when the set is full or when something goes wrong.
- Compressor for waste storage.
- A design which is closed helps to prevent harmful insects and slows down the decomposition of waste.

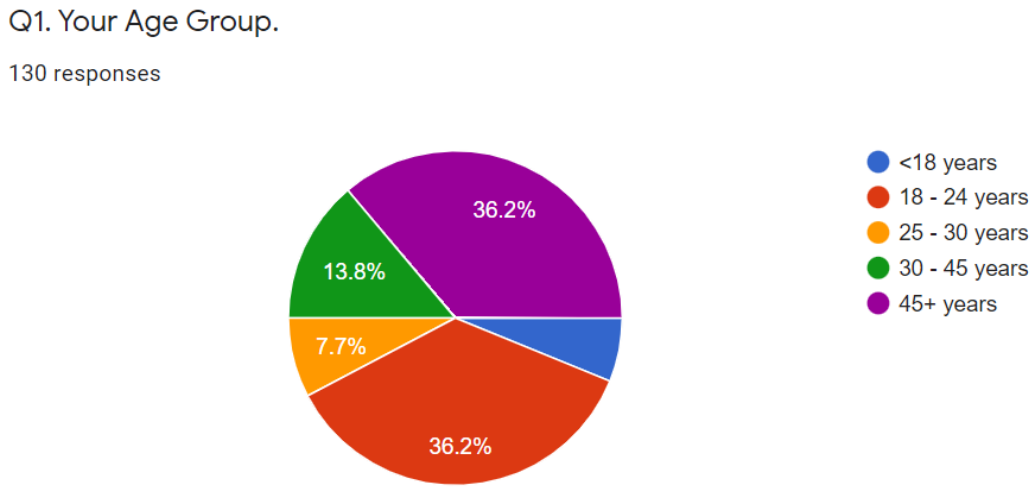
When trash is placed in a holder, a sensor estimates its ability. The compressor then packs the waste and takes the estimation once more. At long last, the savvy garbage bin sends an email or SMS notice when the rubbish is fit to be purged.

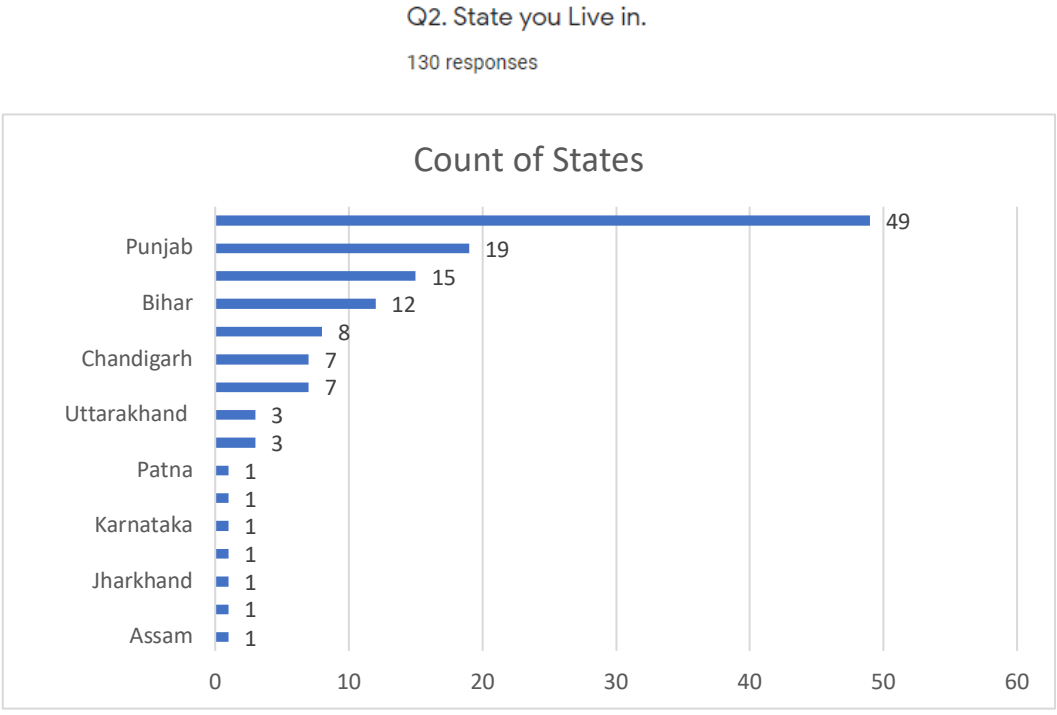
Fig 8: SMS alert module of the Dustbin

CHAPTER 4

DEVELOPMENT AND IMPLEMENTATION

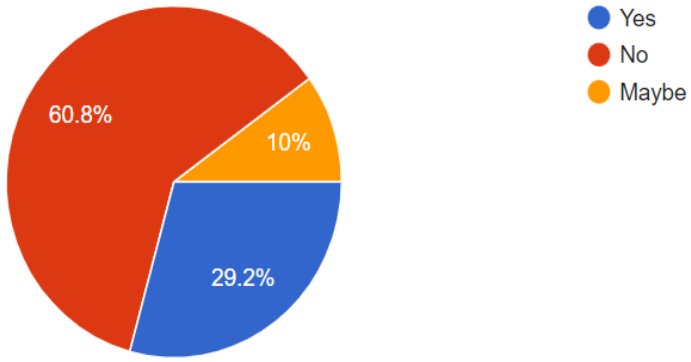
4.1 DEVELOPMENTAL FEASIBILITY





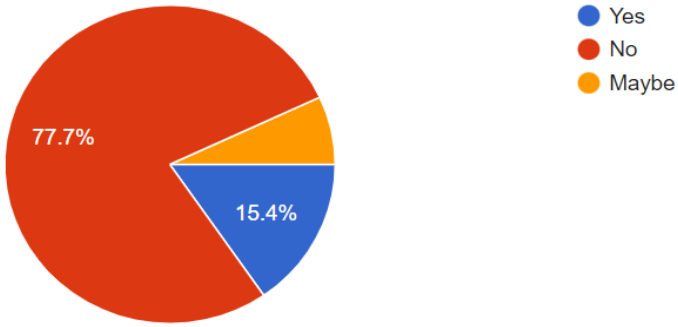
Q3. Have you ever used a Smart-Bin before (Smart-Dustbin)?

130 responses



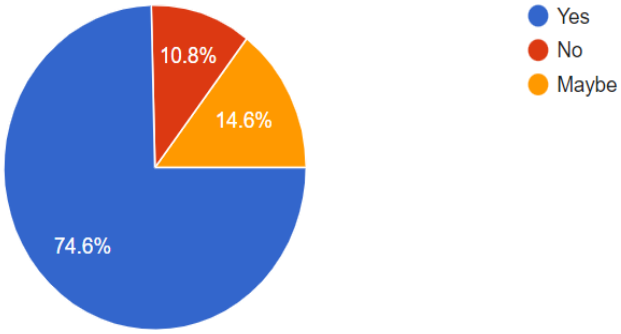
Q4. Have you ever used any Mobile Application for Smart Waste Management?

130 responses



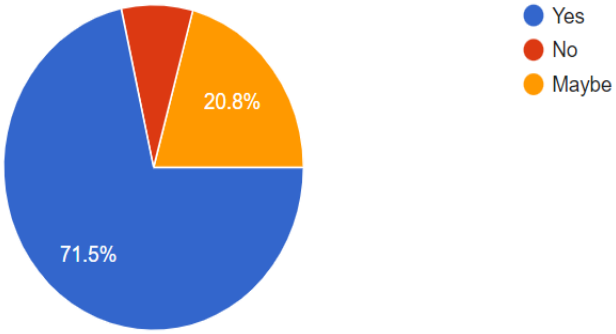
Q5. Will you use a Mobile Application that could help you in Smart Waste Management?

130 responses



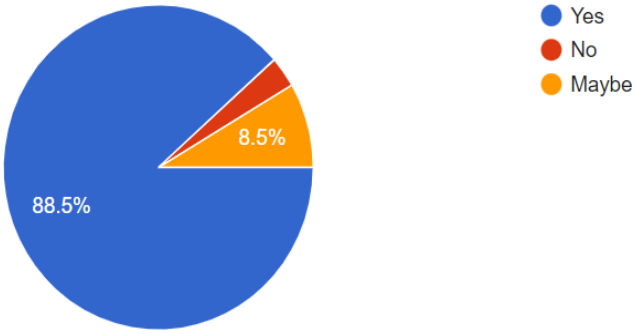
Q6. If by dumping waste in Smart Bins, you can earn some money, will that encourage you to use the smart bins more?

130 responses



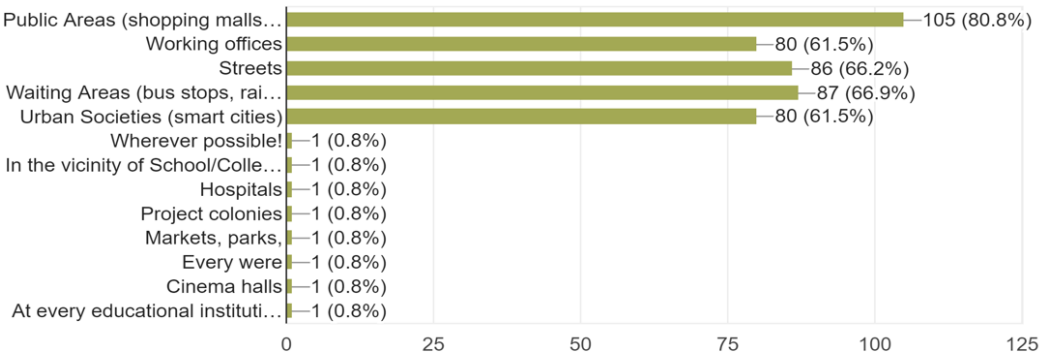
Q7. If nothing is offered to you in return for dumping waste into smart bins, will you be still using them for better waste management?

130 responses



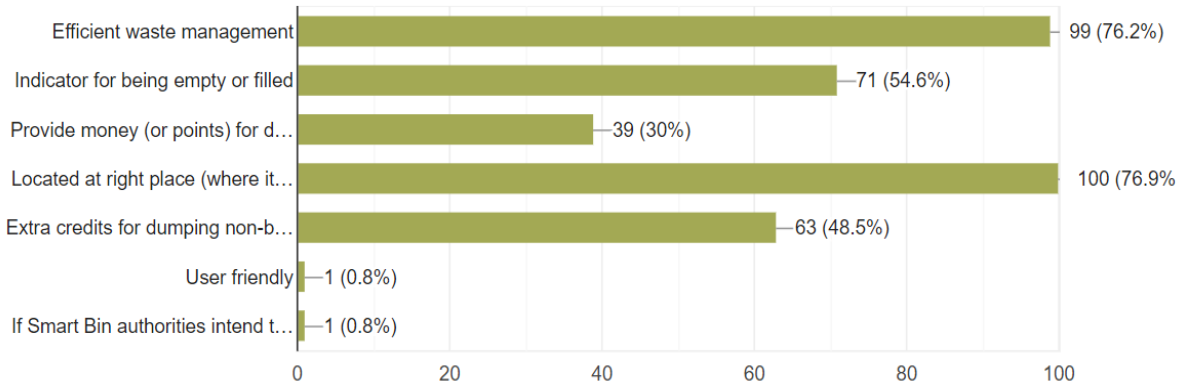
Q8. At what locations do you expect smart bins to be found?

130 responses



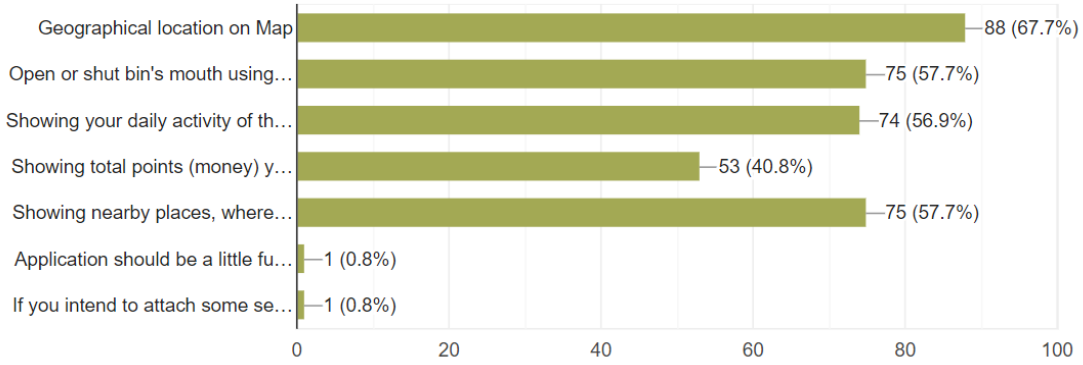
Q9. What services or features do you think a Smart Bin must provide?

130 responses



Q10. What services or features do you think a Mobile Application for Smart Bins must provide?

130 responses



Any comprehension of the major specifications for the scheme is necessary for feasibility study. Feasibility Dimensions for Computers would be as shown in:

- Technology
  - Is the project technically possible?
  - Is it a component of the state of the art?
  - Will failure be limited to the need for an implementation meeting the level?
- Finance
  - Is it financially practicable?
  - Is it realistic for the software company and its customer or company to achieve production at a reasonable pace?

- Time
  - Can the time for the idea to be sold, beat the competition?
- Resources
  - Will the corporation have the capital necessary for success? Two major variables used in the study of viability are:
    a) Technological Feasibility
    b) Cost Feasibility

4.1.1 Technological Feasibility:

The transmission between the savvy waste and the middleware happens through SIM800L GSM/General Packet Radio Service (GPRS) module. With the assistance of this module, it is feasible as far as we're concerned to impart utilizing second era (4G) versatile innovation. Individuals have chosen to utilize this kind of innovation due to the accessibility of broad organization framework and modest working expenses. One more significant part of this module is the entrance network inclusion, as shrewd garbage cans will be dispersed all through the city and frequently under the umbrella of portable administrations. The innovation which uses low recurrence radiation guarantees a superior infiltration and appropriately keeping up with the activity of the framework. At long last, the framework doesn't need huge transfer speed for definite information transmission. Thus, these angles make 4G innovation very more achievable for the proposed edge [25].

Since the focal handling framework is expected to control the savvy garbage can, an Arduino Uno Board [26] was utilized. This is really founded on a programmable actual circuit and an incorporated advancement climate (IDE) which is utilized to compose and transfer code to an actual board.

4.1.2 Cost Feasibility:

1. Arduino Uno Board (₹ 350 *4)
2. SIM800L GSM Module (₹ 350)
3. NEO GPS 6M (₹ 350)
4. Servo Motor (₹ 100)
5. Ultrasonic Sensor (₹ 75 *2)
6. ESP8266 Wifi Module (₹ 450)
7. Display Monitor (₹ 100)
8. Jumper Wires (₹ 300)
9. Rechargeable Battery (₹ 40 *2)
10. Capacitor (₹ 150)
11. 2 channel 5V Relay Module with Optocoupler (₹ 175)
12. Copper plate (₹ 200)
13. Cardboard (₹ 10)
14. Dustbins (₹ 100 *2)
15. Wheels (₹ 35 *4)
16. Plywood (₹ 75)
17. Glue (₹ 250)

Total Cost incurred = ₹3430

So, the cost incurred is very low and if the materials are bought in bulk the cost can be lowered exponentially.

4.2 IMPLEMENTATION SPECIFICATIONS

4.2.1 Hardware Specifications

Some of the hardware parts used in making the Smart Dustbin model are as follows:

1. Arduino Uno Board

This board is the main hardware component of the entire project. It contains the arduino codes which is uploaded from the arduino software and provides instructions to the hardware model to work appropriately.

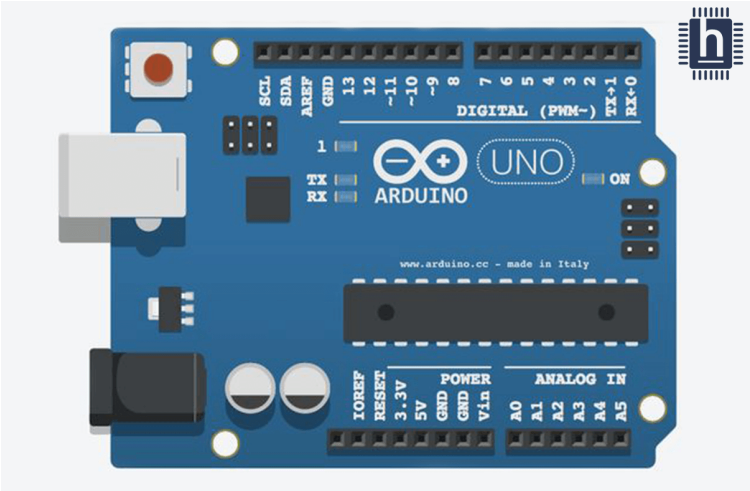


Fig 9: Arduino Uno Board

2. SIM800L GSM Module

This module contains the SIM Card which gives SMS alert to the authorities when the dustbin is full.

Fig 10: SIM800L GSM Module

3. Neo GPS 6M Module

This module provides GPRS connection and sends live location updates to the garbage collector in order to empty the dustbin.

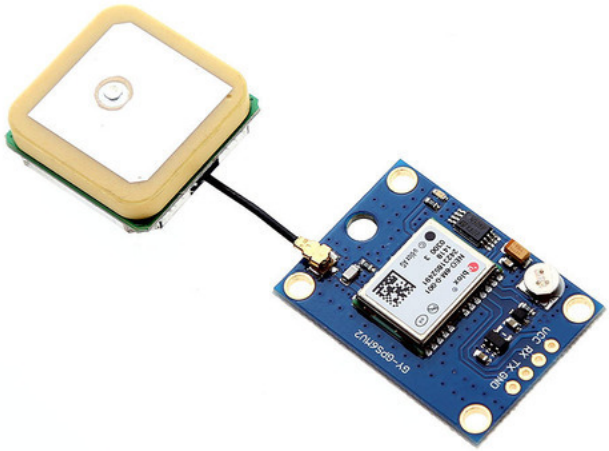


Fig 11: Neo GPS 6M Module

4. Servo Motor

This module allows the movement of various parts of the system like automatic opening of the dustbin's lid and movement of the copper plate during segregation of dry and wet waste.

Fig 12: Servo Motor

5. Ultrasonic Sensor (HC SR04)

Ultrasonic sensor has a lot of importance in our project. This sensor is used to measure distance. It is placed on the lid of the dustbin so that when the copper plate tilts towards it in order to

throw the segregated garbage then the lid automatically opens. This sensor is also used to sense the type of garbage (dry and wet) after the garbage is kept on the copper plate. HC SR04 can sense a maximum of 15 cms.

Fig 13: Ultrasonic Sensor

6. ESP8266 Wifi Module

This module provides internet connectivity to the system as well as to the surrounding environment.

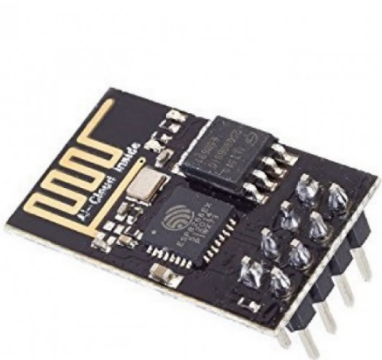


Fig 14: ESP 8266 WiFi Module

7. Display Monitor

The display monitor shows the current filling of both the dustbins. Initially, the monitor will be displaying the actual length of the dustbin. But, as the dustbin will be filling, the number will reduce and finally will be displaying the message when the dustbin will be full.

Fig 15: Display Monitor

8. Jumper Wires

Jumper wires are of three types. They are as follows:–

- male-to-male
- male-to-female
- female-to-female

All these types of wires are used for connecting all the hardware components.

Fig 16: Three types of Jumper Wires

9. Rechargeable Battery

This type of battery is used for providing power supply to the entire Smart Dustbin. It is a Li-ion Battery of 12V.

Fig 17: 12V Rechargeable Battery

10. Capacitor

It is used to equally split 12V current into different components of the model.

Fig 18: Capacitor

11. 2 channel 5V Relay Module with Optocoupler

When the dustbin becomes full, then the display monitor shows that the dustbin is full. Then, relay module helps the GSM module and GPRS module to send the message and the live update of the current location of the dustbin.

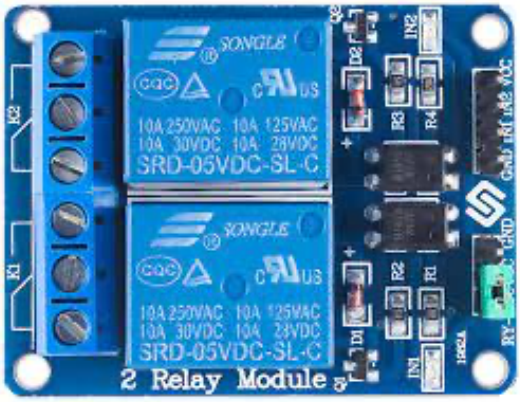


Fig 19: Relay Module

12. Universal single-sided prototype printed circuit board

This universal copper board of dimensions 9cm and 15cm acts as a plate where the unsegregated garbage is kept by the people. After the segregation takes place, the copper plate tilts on one side where that type of garbage needs to be thrown.

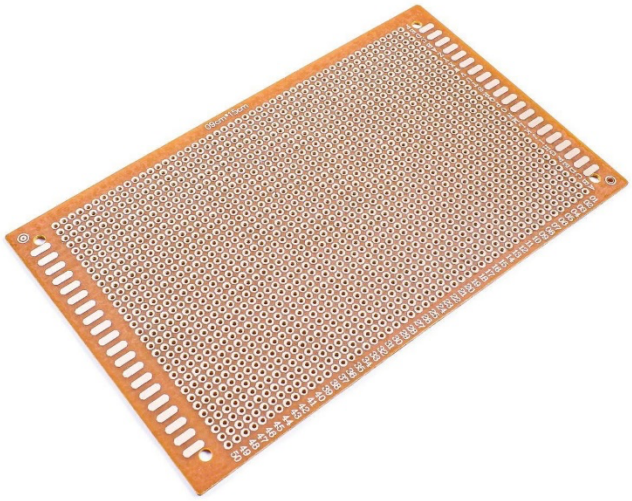


Fig 20: Circuit Board

13. Cardboard

Cardboard is used to make the lids of the dustbins.

Fig 21: Cardboard

14. Dustbins

Two dustbins are used in the model. One is for collecting the dry waste and the other is for collecting the wet waste.

Fig 22: Two Dustbins

15. Wheels and motors

Wheels and motors are attached at the bottom of the dustbins to give them the portability feature.

Fig 23: Wheels and Motors

16. Plywood

Plywood is used to make the framework of the entire system.

Fig 24: Plywood

17. Gluegun

Gluegun is used for fixing the system and making a proper hardware model. Making it waterproof also.

Fig 25: Gluegun

4.2.2 Software Specifications

1. MERN Stack

Automatic Clean Out Corner Website is developed using MERN Stack which comprises of four technologies. They are as follows:

- MongoDB

  MongoDB is an open source, non-social report information base that has gotten exceptionally mainstream over late years. MongoDB flaunts the capacity to increase an application rapidly and cost adequately by having the option to simply add more cuts off. In contrast to social information bases, the information is put away as assortments in key-esteem sets suggestive of affiliated exhibits.

- Express JS

  Express.JS is a web-based Node.JS web-based system, designed to build a single, multi-page, and half-breed web system. It is a standard version of Node.JS. Express.JS is a backend piece of details and previous structure of the React.JS.

- React JS

  Response allows designers to create large web applications that can change details, without having to reload the page. The main motivation behind Respond is speed, flexibility, and precision. Applies only to application UIs.

- Node JS

Node.JS is an open source multi-level runtime climate for building laborer side and framework organization applications. Utilizations of Node.JS are normally conveyed in JavaScript and can run inside the Node.JS structure on OS X, Microsoft Windows, and Linux.

2. Blynk Mobile Application

This mobile application is developed to make a remote control which will allow the dustbins to move in all directions.

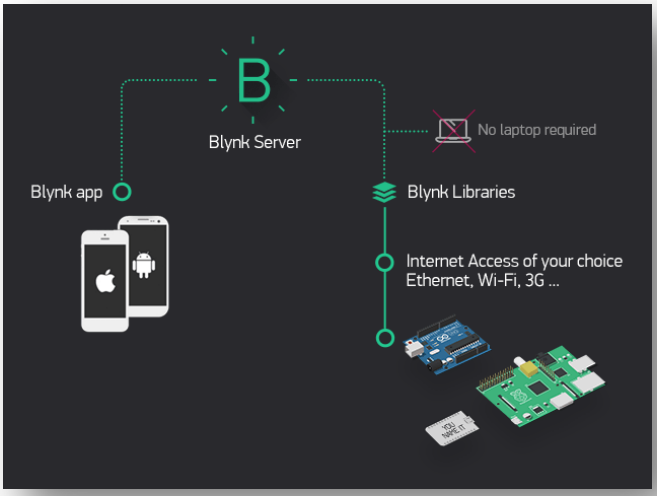


Fig 26: Flow of data from the Blynk Server to the Application and libraries

3. Arduino IDE

It is a software in which all the arduino codes are developed and then uploaded to Arduino Uno Board.

4. Operating System

- Windows 8 and above
- 2GB RAM
- Dual core, Intel i3 Processor

4.3 SYSTEM MODULES AND FLOW OF IMPLEMENTATIONS

4.3.1 System Modules

1. Automatic Opening and Closing of Lid –

The main purpose of our project was to make a zero touchability feature. This purpose is accomplished when we made the automatic opening and closing of lid module. This IoT (Internet of Things) based dustbin senses the trash from a distance and automatically opens the lid in order to collect it. This module has another advantage. Dustbins are always closed and the odour of the garbage is not spread in the surrounding area. Neither animals nor people can open the dustbin forcefully, and, thus, spreading of garbage is also prevented.

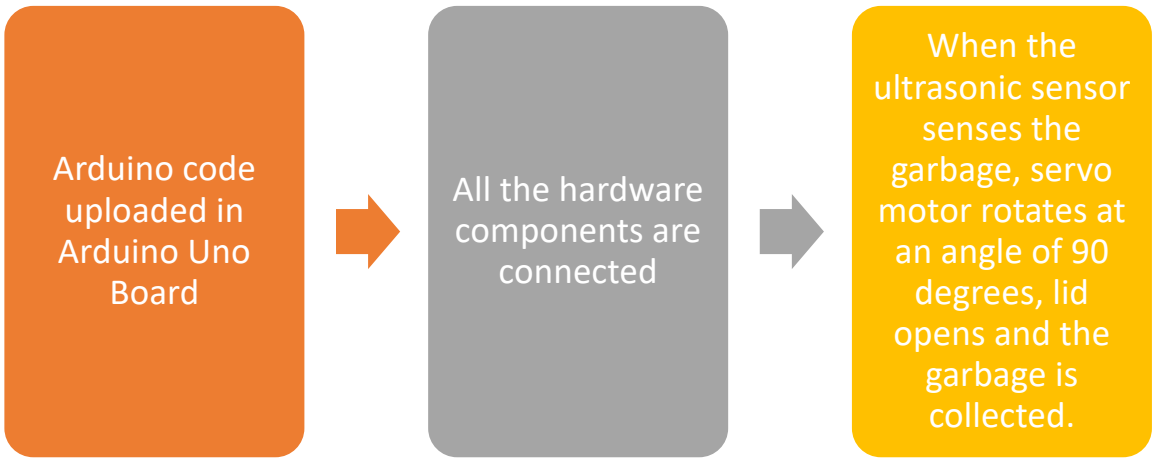


Fig 27: Flow of working of lid opening module

2. Checking the capacity of the dustbin:

When the garbage is put inside the dustbin, then the capacity of the dustbin has to be checked. This will prevent overflowing of the garbage and keep the environment clean, green and disease-free. A display monitor is connected to both the dustbins which show how much full the dustbin is. Both the dustbins are 28cms long. So, initially it is shown that both are having

28 capacity. As garbage is filled, the number is decreased and ultimately, the message of garbage is full is shown.

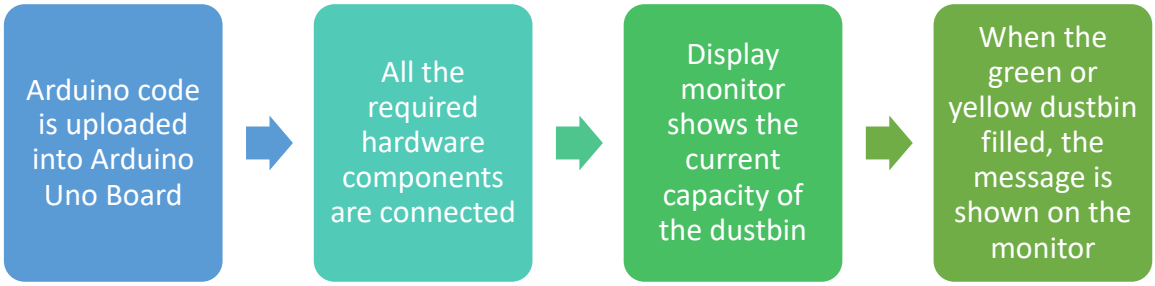


Fig 28: Flow of working of capacity checking module

3. Segregation of dry and wet waste:

The most important feature of our project is this module. A copper plate of dimensions 9cm and 15cm is set up where the user is supposed to keep his/her waste. The ultrasonic sensor will detect whether the garbage is kept or not within 15cm distance. If the garbage is dry, then it will tilt towards the dry dustbin. If the garbage is wet, it will tilt towards the wet dustbin. The whole process is automated so that manual segregation can be avoided.

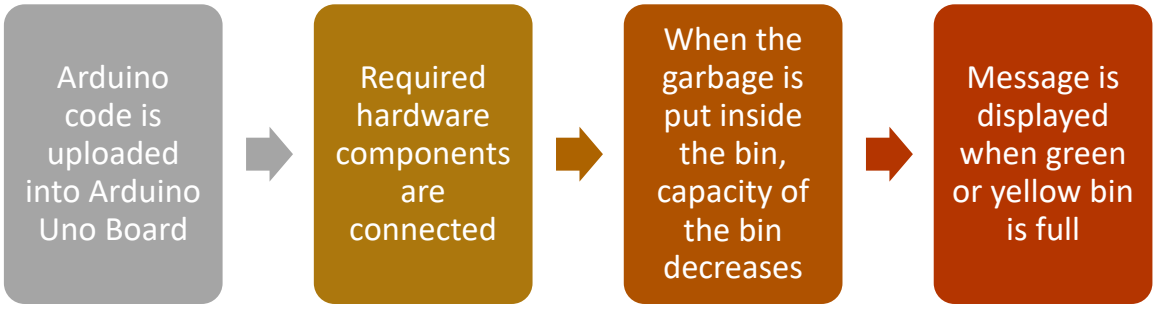


Fig 29: Flow of working of waste segregation module

4. When dustbin is full, send the message to the authorities:

When the display monitor shows that the dustbin is full, then the relay module enables the GPS module to send SMS alert to the authorities and garbage collector so that they can come and collect the garbage from that particular dustbin only. This feature makes our project cost efficient and fuel efficient.

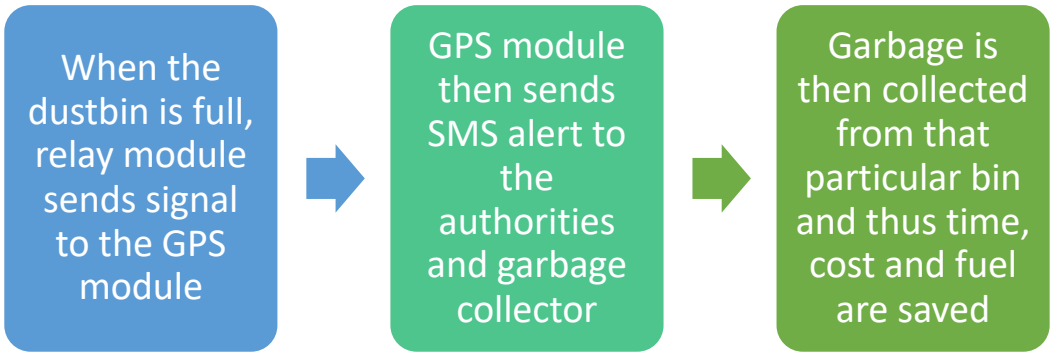


Fig 30: Flow of working of GSM module

5. Live location of the dustbin is sent to the garbage collector for easy collection of garbage:

When SMS alert is sent to the garbage collector, then question arises that at what location the bin is. This question is solved when GPRS module sends the live location of the dustbin along with the SMS. GPRS module is integrated with Google Maps so that exact location can be traced and the authorities can also keep a track of the movement of the vehicles. ESP8266 WiFi module provides internet connection so that GPRS module can easily send the location update to the collector.

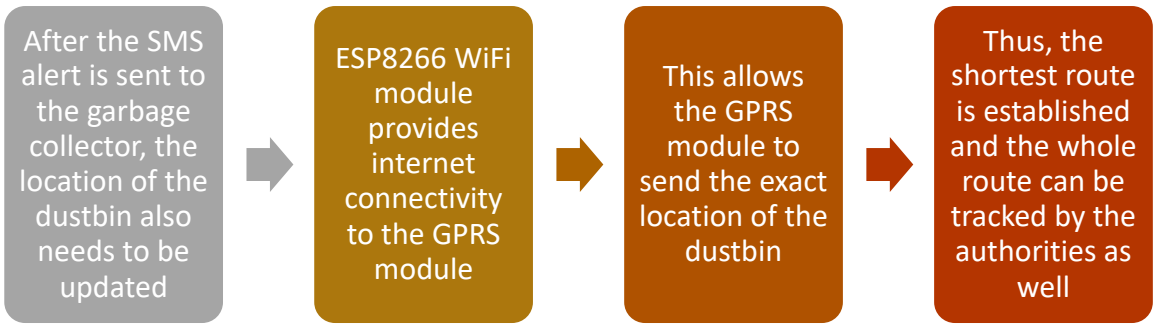


Fig 31: Flow of working of GPRS module

6. ACC Website:

A website is developed using MERN Stack (comprising of four technologies like MongoDB, Express Js, React JS and Node JS) which contains all the features of our project, about our team and many more. A dashboard is developed for the admin which contains all the information about the location of the dustbins, garbage collecting vehicles, garbage collectors as well as the feedbacks provided by the customers.

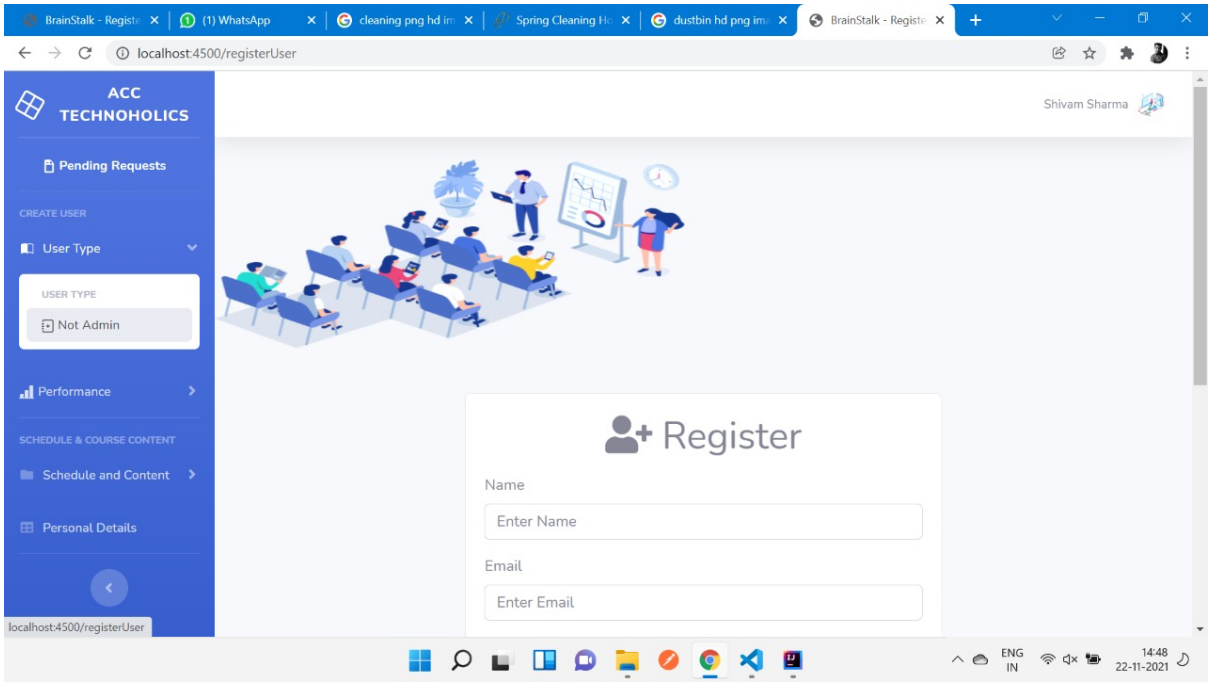


Fig 32: Figure depicting the dashboard our website

7. Mobile Application:

A mobile application is also developed using Blynk Application. This application works as a remote control. It allows our model to move in all directions. The speed of the movement can also be controlled using our application. Blynk Application generates an authentication token which needs to be added to the arduino code and ssid and password of the internet connection also needs to be provided so that the portability feature works perfectly.

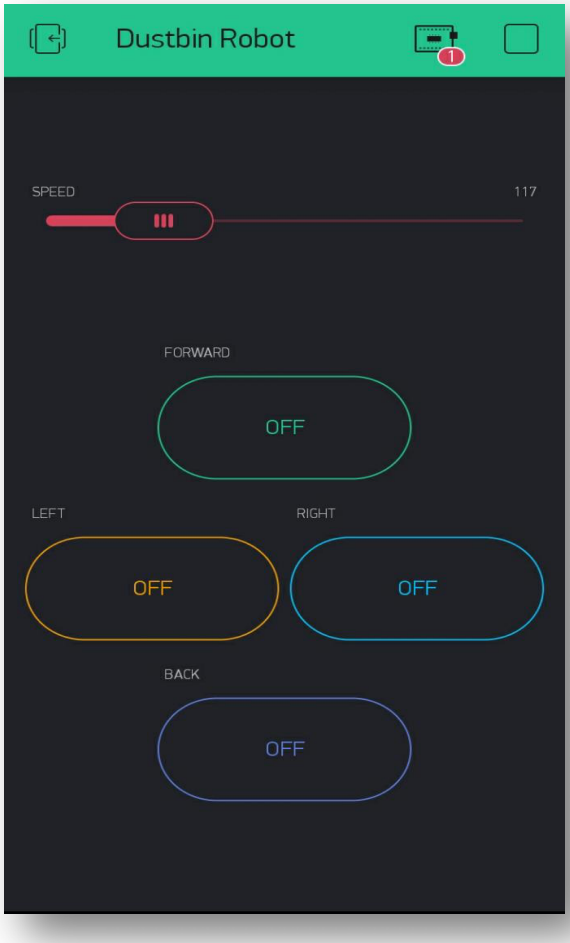


Fig 33: This figure depicts the interface our mobile application

4.3.2 Flow of Implementations

The below flowchart displays the flow of modules in a sequential manner.

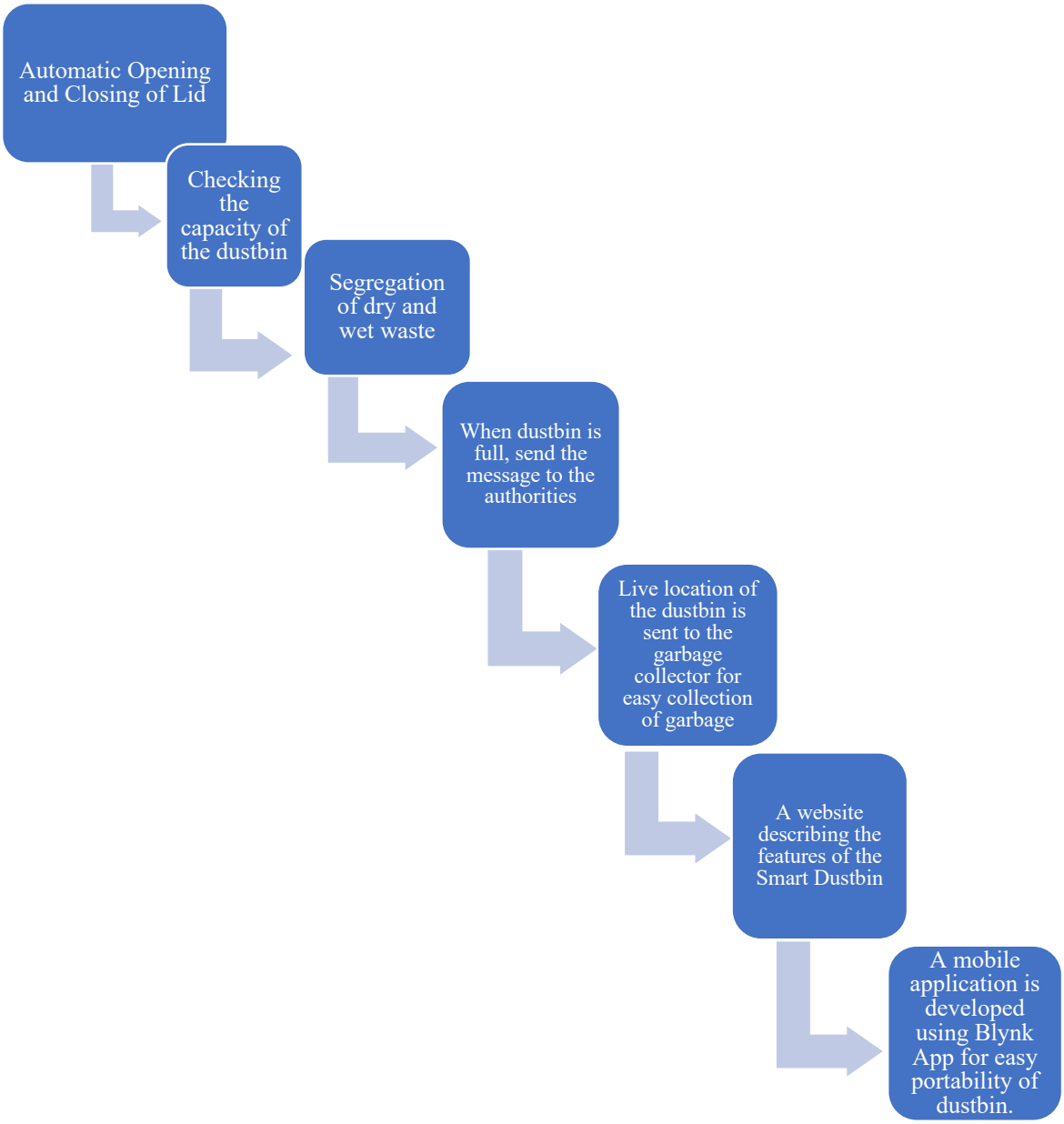


Fig 34: Figure depicting the sequential procedure of our project

4.4 CRITICAL MODULES OF PRODUCT/SYSTEM

In order to make the entire system work, we had come across various issues and errors in various modules. Out of all the seven modules, the most critical modules which we feel to be mentioned are:

- Dry and wet waste segregation – This module is the most crucial feature of our project. Initially, issue was the fixing of the copper plate. The plate needed to be placed at a balanced state so that it can tilt in both directions. After fixing that issue, another error came. When the wet waste was put on the plate, then whole plate became wet and after that dry waste could not be sensed. Thus, we decided to clean the plate after the wet waste segregation so that this issue is not repeated.
- Live location update of the dustbin – In this module, the issue arised with ESP8266 WiFi module. Sometimes it provided a proper internet connection but otherwise, due to poor connection, GPRS module could not sense the location of the dustbin and thus the live location update could not be sent. We tried to overcome this issue by keeping the model in a particular location where we could easily get a proper internet connectivity.

CHAPTER 5

RESULTS AND TESTING

5.1 RESULT

The output of our project comprises of the Arduino codes, Smart Dustbin model, website and mobile application.

5.1.1: Success cases

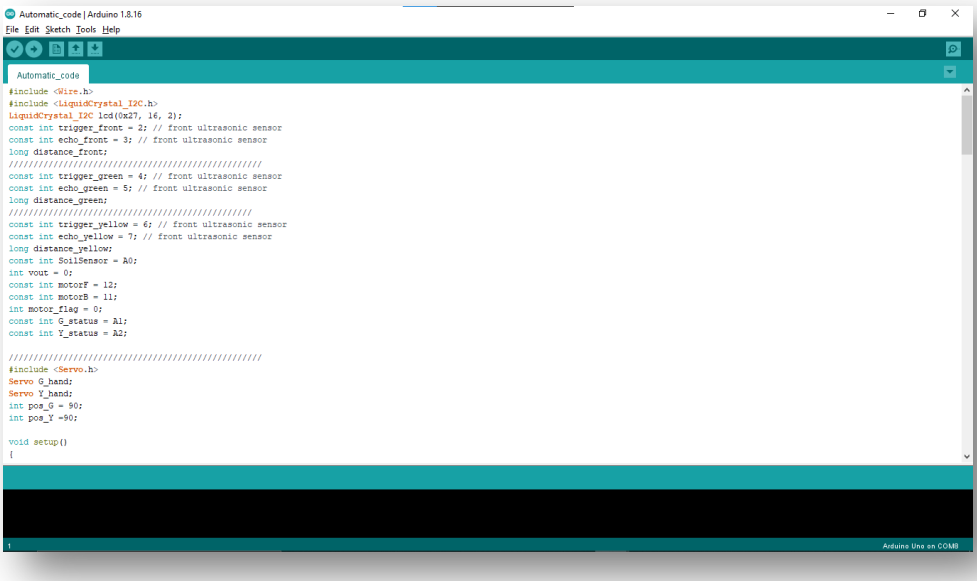


Fig 35: Arduino code depicting automatic opening and closing of lid, capacity checking and segregation of dry and wet waste modules

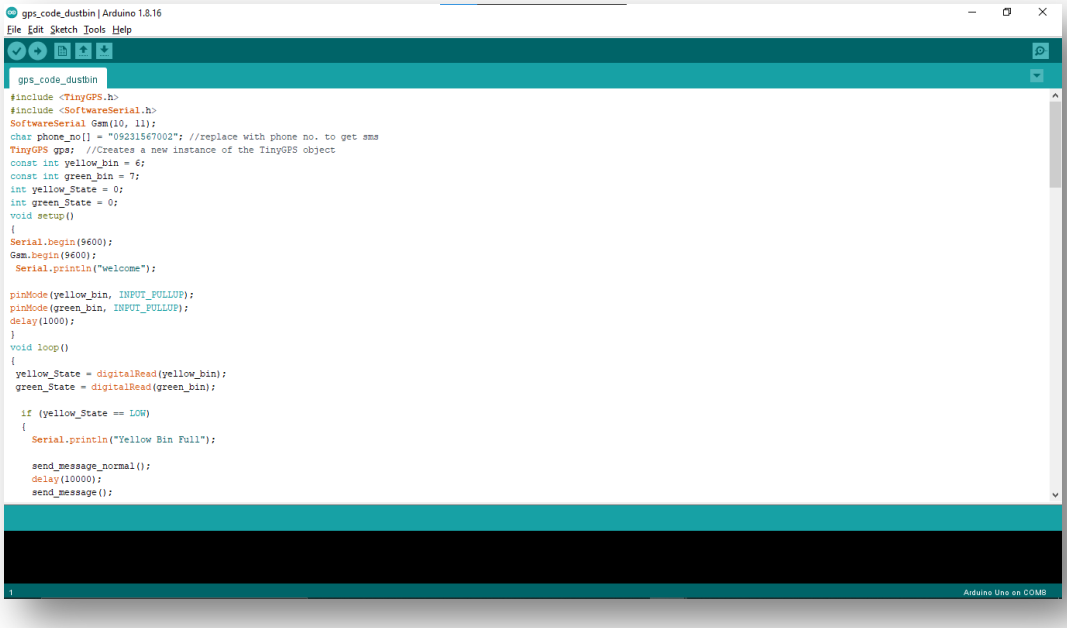


Fig 36: Arduino code depicts GPRS tracking system by sending SMS and live location of dustbin to garbage collector for cleaning the filled dustbin

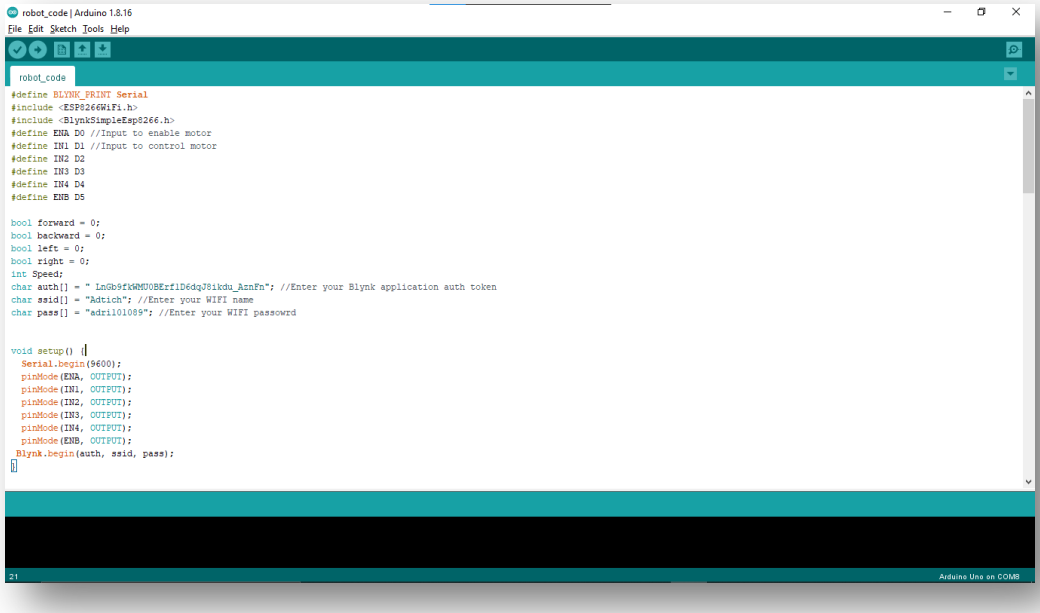


Fig 37: Arduino code depicts the easy portability of dustbin by using BLYNK APP as a remote control

Fig 38: Front view image of our Smart Dustbin Hardware Model

Fig 39: Back view image of our Smart Dustbin Hardware Model

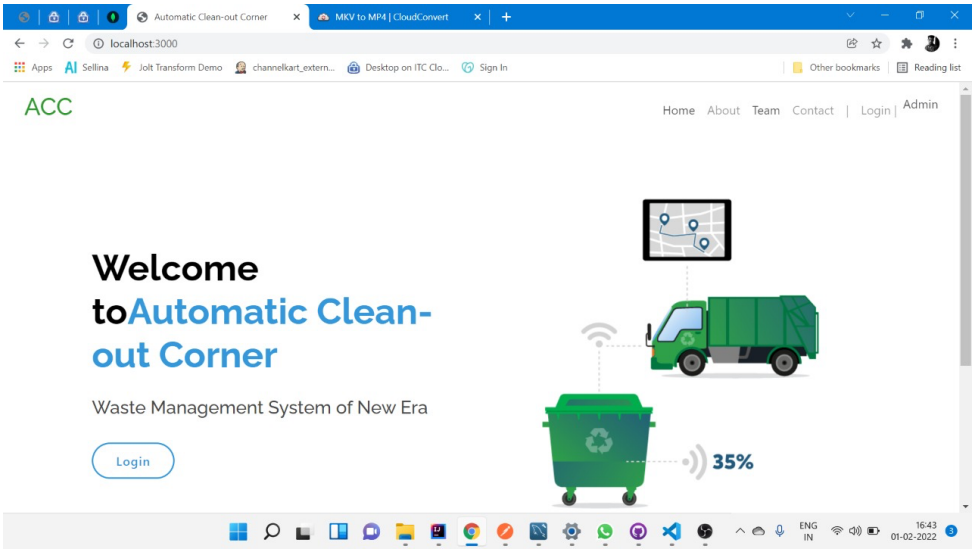


Fig 40: Home Page of our website

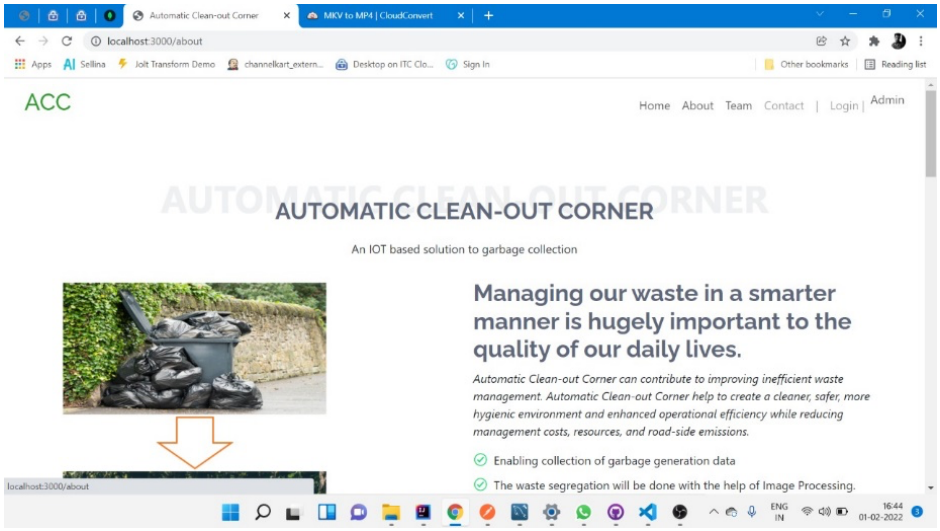


Fig 41: About Us Page

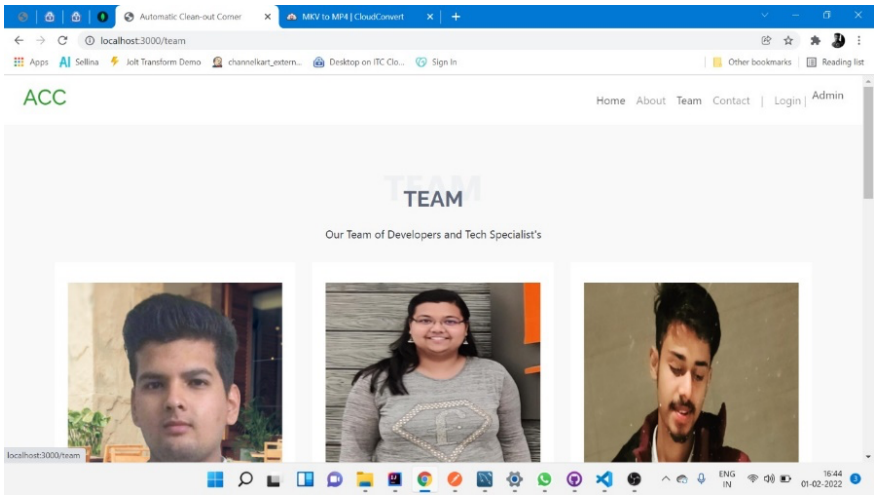


Fig 42: Our Team Page

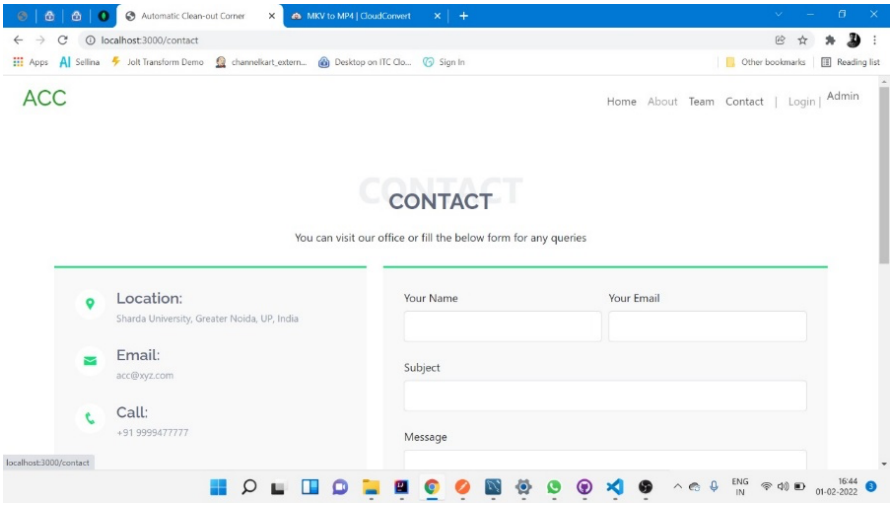


Fig 43: Contact Us Page

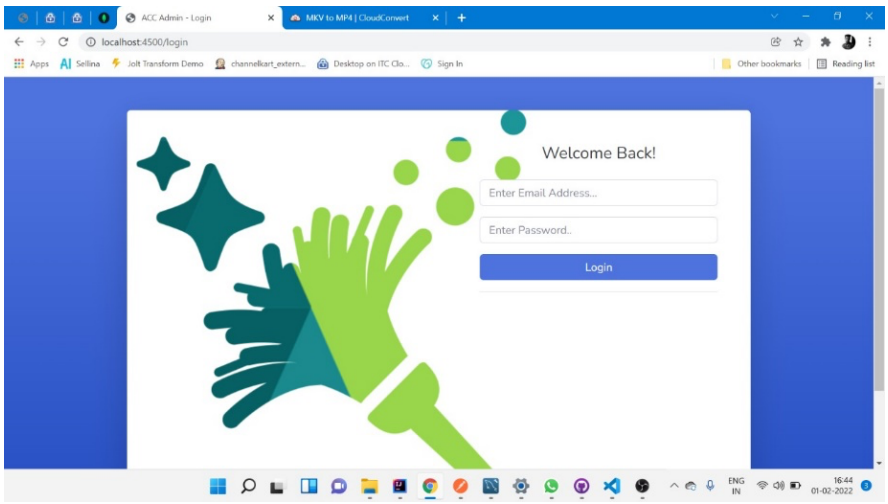


Fig 44: Admin can login using the provided email id and password

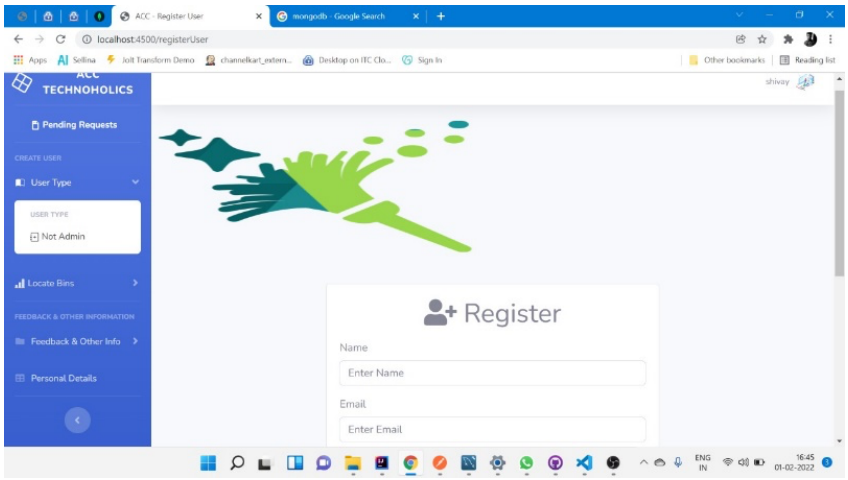


Fig 45: User (Non Admin) can also register themselves to get an access to the website

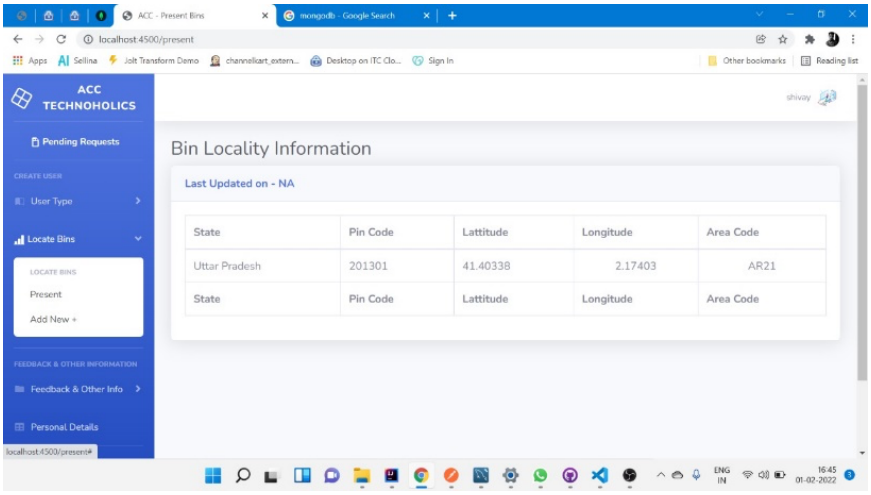


Fig 46: Bin Location Information Page

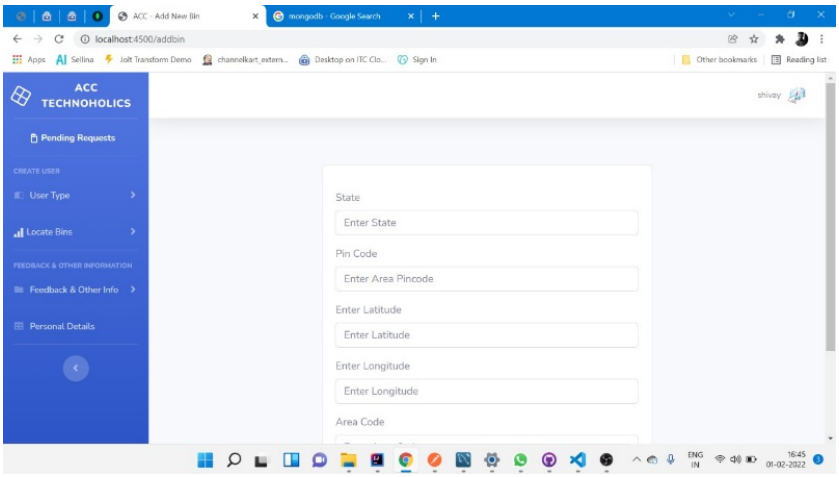


Fig 47: New Bin Information can also be registered

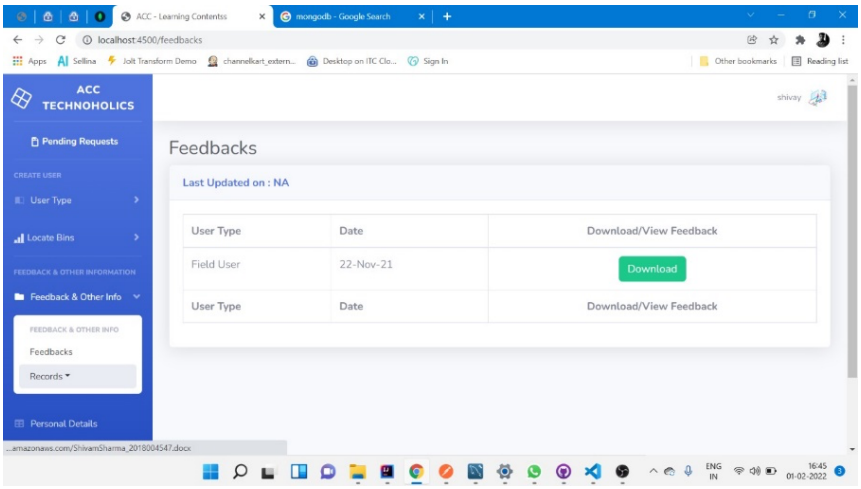


Fig 48: User Feedback can be viewed and downloaded

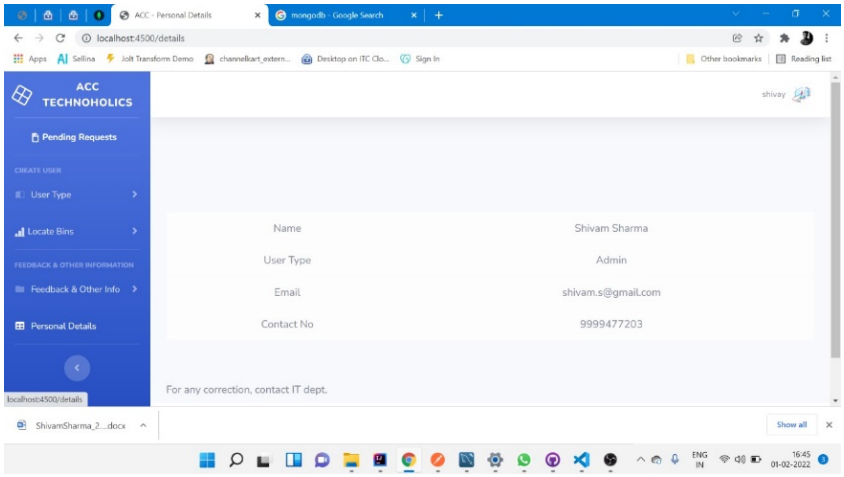


Fig 49: Personal Details of Admin can be seen on this page

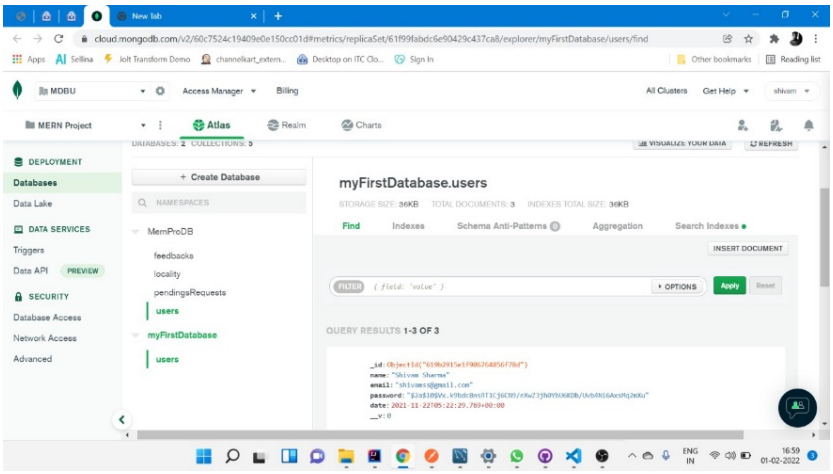


Fig 50: This is the database which stores all the data which are seen in the website

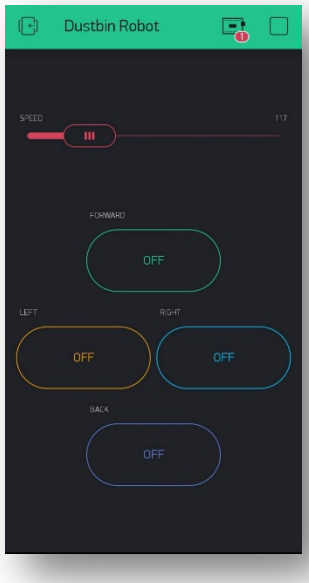


Fig 51: This is the interface of the Blynk Application which controls the mobility of the dustbins.

5.1.2: Failure cases

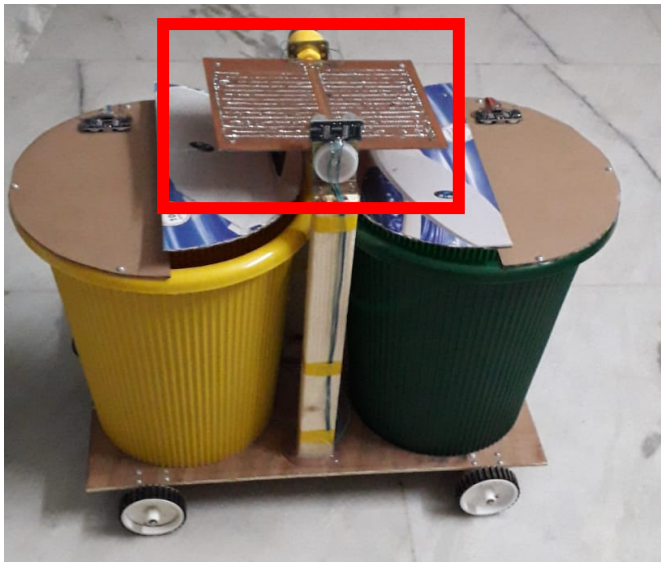


Fig 52: Failure faced in our hardware model

The red marking in the image is the copper plate which is used for segregating the dry and wet waste. Initially, the issue was the fixing of the copper plate. The plate needed to be placed at a balanced state so that it can tilt in both directions. After a lot of effort, we could fix the issue and make our project run successfully.

5.2 TESTING

5.2.1 Type of Testing adapted

5.2.1.1 Software Testing

The job of software testing is to guarantee that projects are proficient and precise. Software testing is an observational science examination directed to furnish buyers with data in regards to an item's quality in the climate in which it is planned to work. This can incorporate yet isn't restricted to running a program or application to distinguish errors. The benefits of testing include error prevention, reduced schedule costs, and extra runtime development.

5.2.1.2 Unit Testing

In this case, each module is evaluated independently. The guidelines for characterizing unit test modules were chosen to distinguish modules that have key usefulness. A module might be either an individual or a method. The unit testing functions that will be tested are as follows:

- Automatic opening and closing of lid can be done
- Capacity of dustbin can be checked
- Segregation of dry and wet waste can be checked
- When the dustbin will be full, it will be checked whether it is sending message and live location to the authorities or not
- The whole garbage collection will be properly tracked
- The portable feature of the dustbin will be checked along with the working of the mobile application
- The data of the position of the dustbins, garbage collectors and vehicles stored in the database can also be checked.

5.2.1.3 Integration Testing

Significant parts are incorporated and investigated collectively during coordination arranging. Integration testing takes unit tested components as data, aggregates them into larger aggregates, applies integration test plan tests to those aggregates, and outputs an integration test framework fit. All the hardware components are checked individually and then integrated to produce a full working model of a smart dustbin.

5.2.1.4 Performance Testing

It is intended to test the runtime execution of a program as part of an integrated system. Check the speed and viability of the program used. It is also known as load testing. There we check the exposure of the frame under the given load.

5.2.1.5 Validation Testing

Toward the beginning or end of the creation cycle, this approach is utilized to decide whether the product fulfills the specified specifications.

5.2.1.6 Testing of GUI

GUI testing is the most common way to test an element's GUI to ensure it conforms to standards, e.g. maintaining a route between icons/buttons with source code.

5.2.2 Test results of various stages

Test Cases

Use Case ID	1
Test Case Name	Checking of Automation of Dustbin Lid
Test Case Description	Working of Automatic Opening and Closing of Lid
Steps	1. Arduino code is compiled and uploaded in the Arduino Uno Board. 2. Hardware connections are checked. 3. Battery connection is also checked.
Expected Results	The lid of the dustbin should be able to automatic open and close the lid when it senses the garbage.
Actual Results	As expected

Use Case ID	2
Test Case Name	Capacity checking of Smart Dustbin
Test Case Description	Capacity of the dustbin is checked
Steps	1. Arduino code is compiled and uploaded in the Arduino Uno Board. 2. Hardware connections are checked. 3. Battery connection is also checked. 4. Display monitor is checked which gives live update of the status of the dustbin.
Expected Results	The display monitor should be able to correctly display the exact capacity of the dustbin so that overflow of garbage does not take place.
Actual Results	As expected

Use Case ID	3
Test Case Name	Waste segregation
Test Case Description	Dry and wet waste segregation
Steps	1. Arduino code is compiled and uploaded in the Arduino Uno Board. 2. Hardware connections are checked. 3. Fitting of the copper plate where segregation takes place is checked. 4. Power supply is checked.
Expected Results	The copper plate shall be able to distinguish between dry and wet waste and appropriately deposit it in the respective bins.
Actual Results	As required

Use Case ID	4
Test Case Name	Sending message to authorities
Test Case Description	Sending which dustbin is full as well as the live location of the dustbin is sent to the garbage collector
Steps	1. Arduino code is compiled and uploaded in the Arduino Uno Board. 2. Hardware connections are checked. 3. GPS and GPRS modules are checked. 4. Battery connection is also checked. 5. Number in which the messages will be delivered is also checked.
Expected Results	When the dustbin is full, it should immediately send message and live location of the dustbin so that the garbage collector comes and collects the garbage on an urgent note.
Actual Results	As expected

Use Case ID	5
Test Case Name	Smart Dustbin Portability
Test Case Description	To check the movement of the dustbin
Steps	1. Arduino code is compiled and uploaded in the Arduino Uno Board. 2. Rechargeable battery is checked. 3. Connection of wheels and motors is checked. 4. Network connection with the Blynk Application is also checked.
Expected Results	The dustbin should be able to show movement when operated using Blynk Application.
Actual Results	As expected

Use Case ID	6
Test Case Name	Website working
Test Case Description	Working of website which stores data
Steps	1. Check source code 2. Database connectivity is checked 3. Icons / buttons are also checked
Expected Results	The website should be able to display the features of the dustbin, data of the vehicles, garbage collectors as well as the feedbacks provided by the customers.
Actual Results	As expected

5.2.3 Conclusion of Testing

Our hardware/software simulated project contains various modules which are tested one-by-one so that errors can be minimized. All the hardware components are tested individually based on their performance, functionality, speed and many more. They are then integrated together to make a functioning system. Again the system is tested after uploading the Arduino codes into the Arduino Uno Boards. Rechargeable batteries are checked and the power supply is also checked so that functioning of the system is not disrupted. Mobile Application is also tested so that the portability feature of the dustbin works properly. Moreover, the website containing the database of the garbage collectors, position of the dustbins, vehicles and the feedback provided by the customers is thoroughly checked to avoid bugs. Thus, the final product has undergone various types of testing in order to make the product work perfectly.

5.3 SUCCESS OF SYSTEM

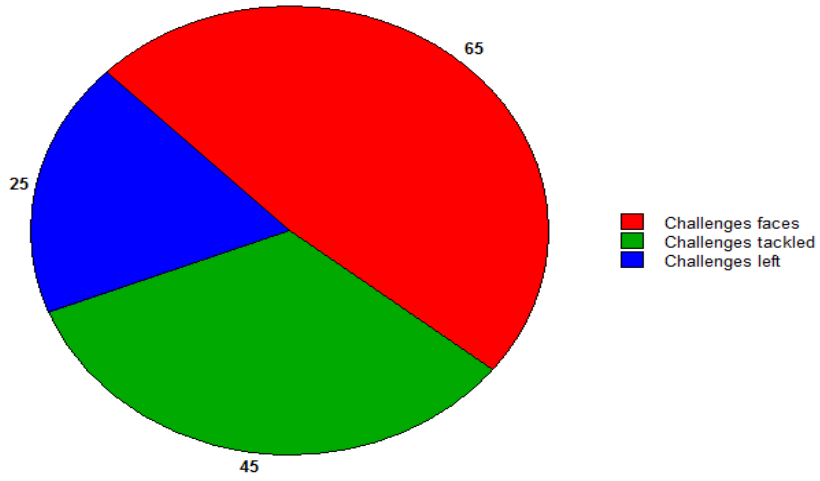


Fig 53: Success of the system in a chart

The above pie chart depicts the challenges that came our way while we were building the project. Most of the issues were solved by us with the help of our guide as well as the Internet. Very few issues arised which were just warnings but didn't interrupted in the working of our model. We tried to break the problem into smaller parts so that it would be easier for us to understand and solve the issue. In this way, we got success and made our project under the given time.

CHAPTER 6
CONCLUSION AND FUTURE IMPROVEMENTS

6.1 PERFORMANCE ESTIMATION

Analogized with first world countries, citizens of less developed countries bear the most from the effect of unreasonably overseen squander. For example, in developing countries, 80,000 huge loads of strong waste are inappropriately discarded consistently, as per the United Nations (UN) [9]. In these nations, waste is usually improperly discarded in waterways, roads or even in outdoors incinerators. These activities do have serious ramifications for human wellbeing, security and the nature. Inappropriately oversaw waste can be a rich wellspring of illness and add to worldwide environmental change through the age of ozone depleting substances, and even fuel metropolitan viciousness with natural corruption. metropolitan. Appropriate waste administration is fundamental for building maintainable and bearable urban communities, yet stays a test for some agricultural nations and urban areas. Viable waste administration frequently turns out to be costly and takes a toll on city budgets. The operation of this vital urban administration requires an efficient and sustainable coordinated framework [10].

This work proposes a proficient and ongoing waste administration model for urban areas, focusing on the citizen perscievness. Our Smart Dustbin incorporates sensor advances where data with respect to the trash is gathered from a savvy garbage bin (everything), continuously, and afterward imparted over the Internet to a web-based stage where the residents can get to and confirm the accessibility of appropriated compartments in the city. A genuine model of the savvy holder has been made, assessed, illustrated, and approved and is fit to be planned into a genuine arrangement

6.2 USABILITY OF PRODUCT / SYSTEM

The waste control machine presently utilized in towns nonetheless follows an vintage and previous form that not meets the desires of regions. It is wasteful and drilled thru huge loadss of series vehicles that tour each day lengthy distances, frequently with the aid of using useless routes, in which others are discovered, and with a timetable for every day or weekly. These elements carry useless costs, exercise in futility and, extra altogether, natural harm, now no longer simplest with the aid of using the outflow of gases from the consuming of non-renewable

energy source, which adds to the nursery effect, however particularly with the aid of using the infection of soil and water assets because of the restriction of waste negativity.

This record proposes an answer that contains hardware, software, and conversation included into an answer that pursuits to improve the control of the waste delivered in towns through a procedure that creates saving of the overall population cash, contributes with the climate, and furthermore empowers citizenship.

In expressions of study's strategy, this notice follows a method principally founded on a case notice accomplished through a real organization of the proposed arrangement. The made arrangement (a genuine model of the shrewd box and waste control application, included through the IoT middleware) is shown and explained using an actual experimentation.

6.3 LIMITATIONS

Some of the disadvantages of smart waste management system are:

➡ The system requires a larger number of bins for separate waste collection which totally depends upon the crowd of a particular city or town. This leads to high upfront costs due to the expensive price of smart trash compared to different techniques.

➡The sensor hubs utilized in the reuse receptacle have a restricted memory size.

➡Remote advancements utilized in the framework, for example, ZigBee and Wi-Fi have more limited reach and lower information rates. In RFID based frameworks, the RFID tag is impacted by encompassing metal articles (if any).

➡ It diminishes the demand for labor, leading to an increase in the unemployment rate of the unskilled.

➡ Need to organize training for people involved in smart waste management system.

6.4 SCOPE OF IMPROVEMENT

Utilization examples of the 21st century have been progressively impacted by metropolitan spaces in their specific conditions. As per data from the US, by 2050 around 70% of the populace will live in metropolitan regions, and this quick development of individuals it is very stressing to live in metropolitan networks. apprehensive, on the grounds that urban communities don't need to be topped off. Along these lines, shrewd city arrangement has slowly been thought of and talked about around the world to tackle this issue. Following this strategy, this paper introduced a successful IoT-based and constant waste administration model for dealing with the living climate in metropolitan networks, zeroing in on the perspective of inhabitants. The proposed structure utilizes sensor and matching advances where squander data is gathered from a glossy, consistent cartridge, and afterward shipped off a web stage where occupants can access and check the availability of dustbins which are circulated all through the whole metropolitan region.

Consider preparing a true model of the brilliant canister and running another universally useful trash the executives application and related web delivering, and furthermore consider testing logical examination, it very well may be construed that the structure can actually foster the manner in which people deal with their waste and increment their materials and funds.

In future work, the application made for this course of action can be improved by adding new officials who can finish more significant client connections and make the framework all the more impressive. One stage to decide the best in classifier courses, looks for efficiency with lower working expenses of the truck. What's more, the hypothesis and functional expenditure of this arrangement will be an especially alluring test and might be gone on as future work.

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APPENDICES

IEEE YESIST-12 (7th Semester Hackathon)

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Azadi Ka Amrit Mahotsav

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Winner - 2nd Position

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