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Smart Dustbin with IOT

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Abstract: ***In recent decades, Urbanization has increased tremendously. During the same phase, there is an increase in waste production. Waste management has been a crucial issue to be considered. This project is a way to achieve this good cause. In this project, the smart dustbin is built on a microcontroller-based platform Arduino Uno board which is interfaced with a GSM modem and an 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 as 5cm. Arduino will be programmed in such a way that when the dustbin is being filled, the remaining height from the threshold height will be displayed. Once the garbage reaches the threshold level ultrasonic sensor will trigger the GSM modem which will alert the municipal corporation. Once the dustbin is empty, people can reuse the dustbin. At regular intervals, the dustbin will be empty. Once these smart bins are implemented on a large scale, by replacing our traditional dustbins, waste can be managed efficiently as it avoids unnecessary lumping of waste on a roadside. The Foul smell from these rotten wastes that remain untreated for a long time, due to the negligence of authorities and carelessness of the public may lead to long-term problems.

Breeding of insects and mosquitoes can create a nuisance around promoting an unclean environment. This may even cause dreadful diseases. To stop this from happening, our project will help avoid such cases.

I. INTRODUCTION

A. Overview

There is one more issue that has got to be managed. Garbage! Pictures of garbage bins being overfull and also the refuse being spilled out from the containers may be seen all around.

This prompts different ailments as the extensive number of insects and mosquitoes breed thereon. a significant test within the urban areas is powerful waste administration.

Thus, a smart dustbin may be a framework that may annihilate this issue or if nothing else diminish it to the bottom level. Greater a part of viruses and bacterial contaminations create in dirtied conditions. Defending the Environment utilizing Technology sources is required at the moment.

Dominant a part of the general community environment is by all accounts contaminated with the material. In this way, the modernization of the restaurants is required by giving the smart technology waste product in landfills rot, attract pests, and dirty our air and groundwater. By updating your kitchen dustbin to smart bin Air you retain 1500 kgs of nourishment waste removed from landfills in a very 10 years!

B. Motivation

As per the UN, between now and 2025, the whole populace will increment by 20% to realize 8 billion tenants (from 6.5 today).With this expansion in the populace, the duties towards waste administration additionally increments. Our waste organization systems and our financial circumstances, notwithstanding doing what has to be done, are unequipped for handling the creating measures of waste generally. So unless another worldview of worldwide collaboration and administration is embraced, a tsunami of uncontrolled dumpsites is going to be the vital waste administration technique, particularly in Asia. In the geographical region of America, point of entry drives the trail with a landfill transfer redirection rate of 72% and therefore the city has set itself an objective of zero waste to landfill by 2020. This paper gives us a standout amongst the foremost proficient approaches to stay our condition perfect and green.

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II. SOFTWARE/HARDWARE REQUIREMENTS SPECIFICATION

A. External Interface Requirements

1) User Interface

The LiquidCrystal library allows you to control LCDs that are compatible with the Hitachi HD44780 driver. There are many of them out there, and you can usually tell them by the 16-pin interface.

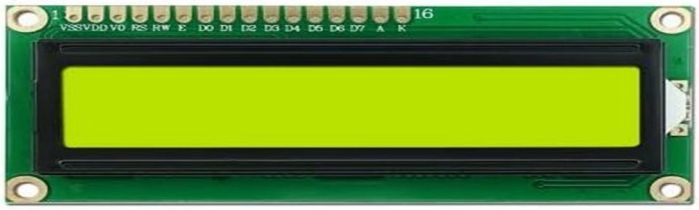


Fig. 2.1.1Output on a 16x2 LCD

The LCDs have a parallel interface, meaning that the microcontroller has to manipulate several interface pins at once to control the display. The interface consists of the following pins:

A register selects (RS) pin that controls where in the LCD's memory you're writing data to. You can select either the data register, which holds what goes on the screen or an instruction register, which is where the LCD's controller looks for instructions on what to do next.

A Read/Write (R/W) pin that selects reading mode or writing mode.

An Enable pin that enables writing to the registers.

8 data pins (D0 -D7). The states of these pins (high or low) are the bits that you're writing to a register when you write or the values you're reading when you read.

There's also a display contrast pin (Vo), power supply pins (+5V and GND), and LED Backlight (Bklt+ and BKlt-) pins that you can use to power the LCD, control the display contrast, and turn on and off the LED backlight, respectively.

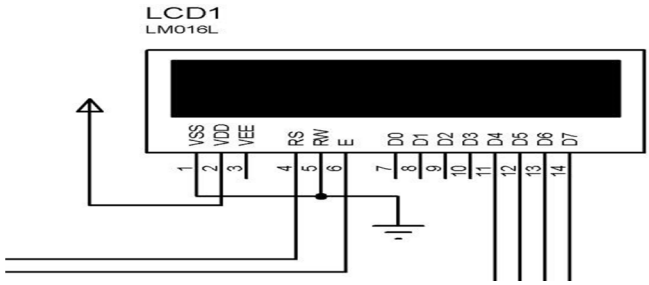


Fig. 2.1.1 Schematic Diagram

2) Hardware Interfaces

a) Arduino Uno

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards can read inputs - a light on a sensor, a finger on a button, or a Twitter message - and turn them into an output - activating a motor, turning on an LED, or publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

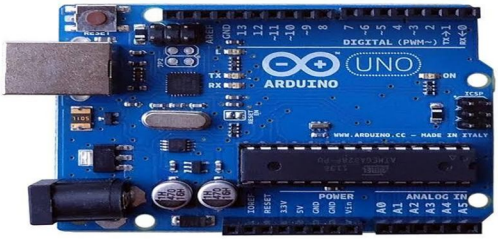


Fig 2.1.2. Arduino Uno

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b) GPS Receiver

One of the global positioning system (GPS) devices ultilizes data fromsatellites to locate a specific point on the Earth in a process named trilateration. Meanwhile, a GPS receiver measures the distances to satellites using radio signals to trilaterate. And trilateration is similar to triangulation, which measures angles, depicted in this illustration (Tim Gunther, 2020). GPS modules contain tiny processors and antennas that directly receive data sent by satellites through dedicated RF frequencies. From there, it'll receive timestamp from each visible satellites, along with other pieces of data. If the module's antenna can spot 4 or more satellites, it's able to accurately calculate its positionand time.

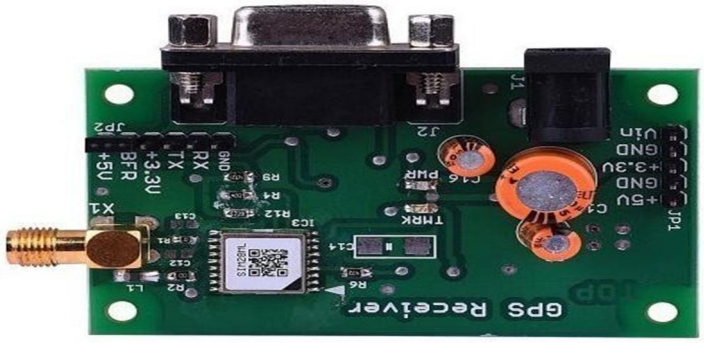


Fig. 2.1.3 GPS Receiver

3) Software Interfaces

Arduino IDE

Arduino IDE is an open-source software, designed by Arduino. C and mainly used for writing, compiling & uploading code to almost all Arduino Modules.

It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.

4) Communication Interfaces

GSM Sim800

GSM SIM800C Modem with Antenna Modules baud rate is configurable from9600-115200 through AT command. The GSM GPRS Modem is having internal TCP/IP stack to enable you to connect with the internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer applications in the M2M interface.

The onboard Regulated Power supply allows you to connect a wide range of unregulated power supply. Using this modem, you can make audio calls, SMS, Read SMS,attend the incoming calls and internet, etc through simple AT commands.



Fig. GSM Module :Sim 800L

B. Software Requirements

1) Arduino IDE
2) Star UML
3) Power Point

C. Hardware Requirements

RAM	1GB
GSM	900/1800MHz
GPS Receiver	850/1900MHz
IC kit	5v
Microcontroller	3v
GPS Antenna	1575MHz
LCD Display	5v
Ultrasonic sensor	3v
Jumper wire	3 types
Mobile SimCard	1

III. SYSTEM ARCHITECTURE

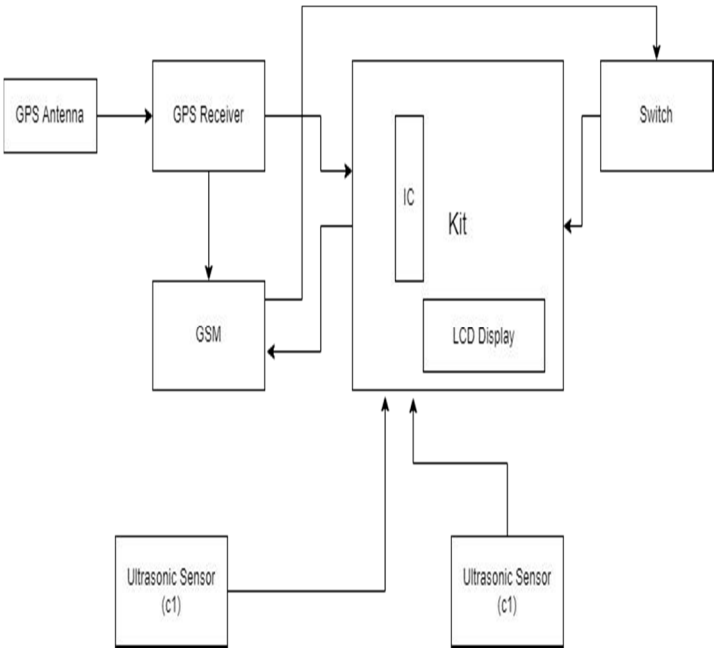


Fig . System Architecture Of Smart Dustbin

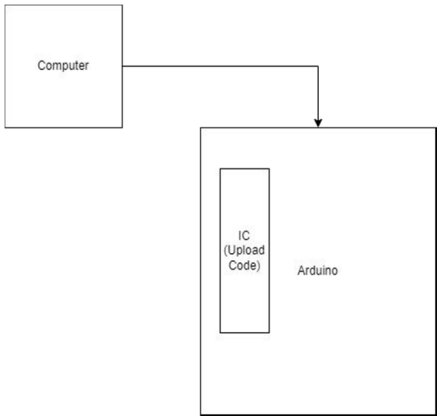


Fig . Arduino To Upload Code

A. Arduino

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishingsomething online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

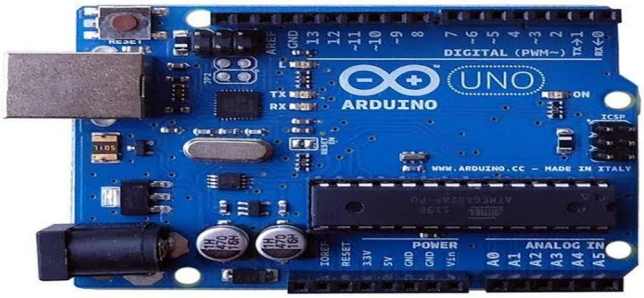


Fig . Arduino Uno

B. GSM Module: SMI800L

GSM SIM800C Modem with Antenna Modules baud rate is configurable from 9600-115200 through AT command. The GSM GPRS Modem is having internal TCP/IP stack to enable you to connect with the internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer applications in the M2M interface.

The onboard Regulated Power supply allows you to connect a wide range of unregulated power supplies. Using this modem, you can make audio calls, SMS, Read SMS, attend the incoming calls and the internet, etc through simple AT commands.



Fig . GSM Module: SIM800L

C. GPS Receiver

One of the global positioning system (GPS) devices utilizes data from satellites to locate a specific point on the Earth in a process named trilateration. Meanwhile, a GPS receiver measures the distances to satellites using radio signals for trilateration. And trilateration is similar to triangulation, which measures angles, depicted in this illustration (Tim Gunther, 2020). GPS modules contain tiny processors and antennas that directly receive data sent by satellites through dedicated RF frequencies. From there, it'll receive timestamps from each visible satellite, along with other pieces of data. If the module's antenna can spot 4 or more satellites, it's able to accurately calculate its position and time.

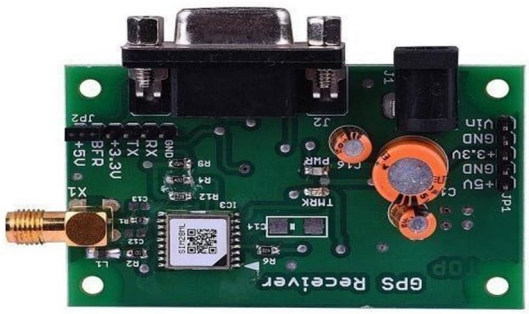


Fig. GPS Receiver

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D. Microcontroller

The ATMEGA328P-PU is a low-power CMOS 8-bit microcontroller based on the AVR-enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328P-PU achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed.

The ATmega328P-PU AVR is supported with a full suite of program and system development tools including C Compilers, Macro Assemblers, Program Debugger/Simulators, In-Circuit Emulators, and Evaluation kits.



Fig . *Microcontroller*

E. Ultrasonic Sensor

This is a simple and easy-to-use ultrasonic sensor. It can detect objects in front of it within a range of 2-400cm. It is the perfect sensor to use in robotics, obstacle detection, etc. It has a wide beam angle unlike IR Sensors, which enables it to detect obstacles within a wide angle. Signals can be read from the 4-pin interface (Vcc, Trig, Echo, GND). One pin is used to trigger the ultrasonic transmitter and another one is used to read the echo. This HC SR04 distance sensor offers both accuracy and stable readings that are not affected by sunlight or object color



Fig . Ultrasonic Sensor

F. LCD Display

This is a basic 16-character by 2-line Alphanumeric display. Black text on Green background. Utilizes the extremely common HD44780 parallel interface chipset. Interface code is freely available. You will need a Minimum of 6 general I/O pins to interface to this LCD screen. Includes LED backlight. Works in 4-bit and 8-bit Modes

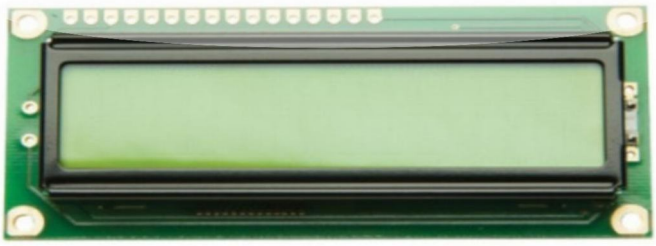


Fig. LCD Display

G. Jumper Wire

This cable is an electrical wire or group of them in a cable with a connector or pins at each end, which is normally for interconnecting the components of a breadboard or other prototype or test circuit, internally or with other equipment or components without soldering



Fig. Jumping Wire

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H. Mobile Sim Card

An IoT SIM card, also known as M2M SIM Card (machine-to- machine), is a Subscriber Identity Module that is used in IoT (Internet of Things) devices to identify them as they try to connect to a 2G, 3G, 4G-LTE, Cat-M, NB-IoT, or 5G wireless cellular network.



Fig . Mobile Sim Card

IV. FLOWCHART

A. Algorithm

1) Start
2) Initiate ports and Sensor.
3) Read sensor data.
4) Set threshold value of each sensor.
5) Check given data compare with threshold value.
6) If threshold exceed Send Location.
7) Show data on LCD.
8) STOP

Flowchart

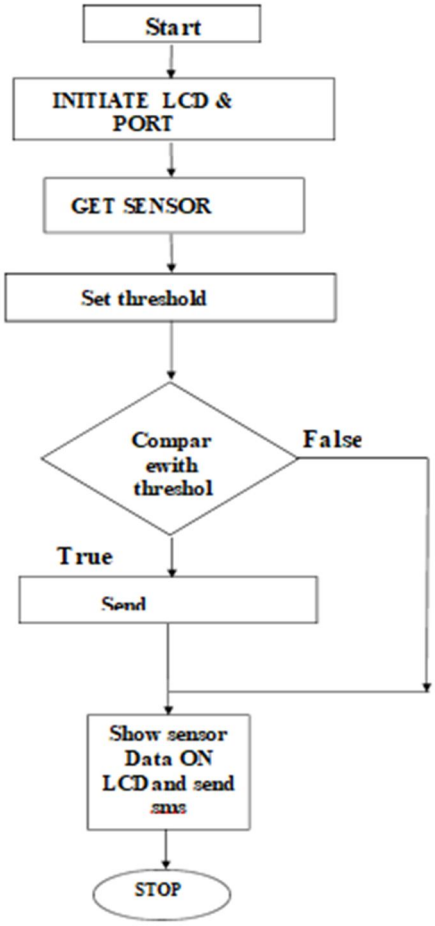


Fig. Flow Chart Of Smart Dustbin

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V. ADVANTAGES

1) The overflowing of dustbins can be stopped.
2) The overflowing and cleaning of smart bins will be continuously monitored and effectively managed thus making clean and empty bins available to common people.
3) Economically Effective technique if once implemented successfully.
4) It also intends at building clean as well as green surroundings.

VI. LIMITATIONS

1) Due to the long location distances, dustbins may already overflow.
2) Sometimes there will be spam accounts.
3) Damage can happen to anyone.

VII. APPLICATIONS

Can be best used by municipal corporations for their betterment of management regarding the collection of waste

VIII. CONCLUSION

This project involves less human effort while automating waste disposal by integrating hardware and application. The hardware detects the level of garbage and the application sends the notification of garbage retrieval. This project saves the effort of garbage collectors by saving their time and the cost of fuel for the vehicle. It provides a proper disposal method for garbage, eliminating the dustbin getting filled and garbage spilling out. This is an efficient way of disposing of garbage considering the cost and easy-to-use attributes. We have used cheap and efficient components to make the project economical. Code compaction has made the project more efficient by defining proper deliverables. The project can be easily used by users garbage collectors and administration for disposal and retrieval of waste. It can be deployed anywhere for proper waste disposal and pickup, which will help in making the environment cleaner and greener

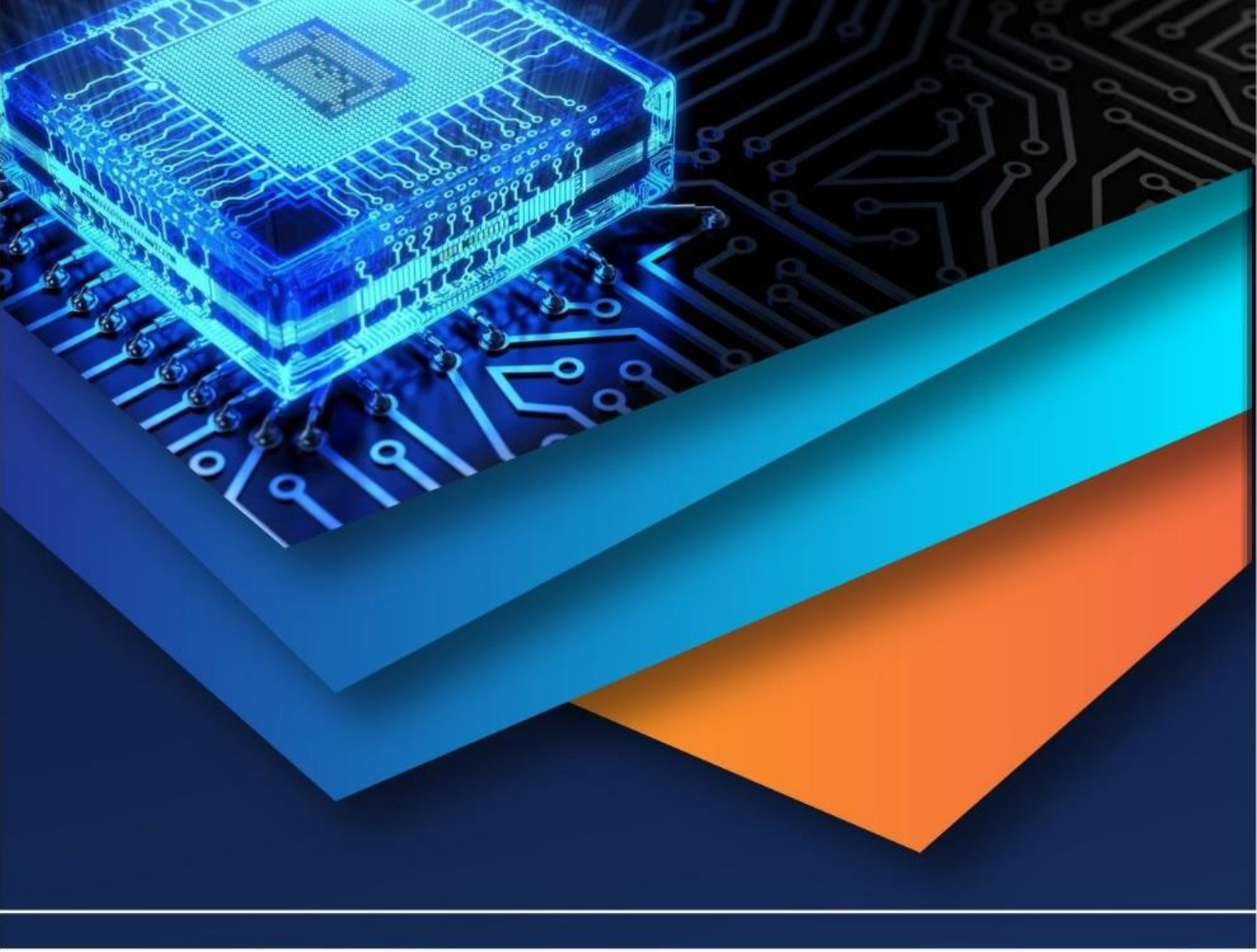
IX. FUTURE SCOPE

There can be many different modules that can be implemented with this project. The modules which can be included are of various domains ranging from IoT to ML to AI to Big Data Analytics. Some of the improvements to this project can be providing the power source for the board using solar power which is a more eco-friendly solution. Analytics of the peak times of locations where the dustbin is filled and for how long can be done to save human effort. Automation of opening and closing of lid and automation of switching on and off of the entire system is also a possibility that will, end of the day, save a lot of power

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