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# Smart Dustbin Using Ardunio

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***Abstract:*** ***In this paper, a system is introduced to manage waste in big cities effectively without having tomonitor the parts 24x7 manually. Here the problemof unorganized and non- systematic wastecollection is solved by designing an embedded IoT system which will monitor each dumpster individually for the amount of waste deposited. Here an automated system is provided for segregating wet and dry waste. A mechanical setup can be used for separating wet and dry waste into separate containers here sensors can be used for separating wet and dry. For detecting the presence of any waste wet or dry can be detected using anIR sensor in the next step for detecting wet waste a moister sensor can be used. In this process, if only IR is detected motor will rotate in the direction of the dry waste container if both the sensor detectsthe waste then it will go to the wet container. Both these containers are embedded with ultrasonic sensors at the top, the ultrasonic sensor is used for measuring distance. This makes it possible to measure the amount of waste in the containers if one of the containers is full then alert message will be sent to the corresponding personal.***

***Keywords: ATmega328, EEPROM, IOREF,FTDI USB.***

## I. INTRODUCTION

Today big cities around the world are facing a common problem, managing the city waste effectively without making city unclean. Today's waste management systems involve a large numberof employees being appointed to attend a certain number of dumpsters this is done every day periodically.

This leads to a very inefficient and unclean system in which some dumpsters will be overflowing some dumpsters might not be evenhalf full. This is caused by variation in population density in the city or some other random factor this makes it impossible to determine which part needs immediate attention. Here a waste management system is introduced in which each dumpster is embedded in a monitoring system which will notify the corresponding personal if the dumpsteris full. In this system, it is also possible to separate wet and dry waste into two separate containers. This system provides an effective solution to waste management problem.

## II. LITERATURE REVIEW

A Smart Waste Bin for Smart Waste Management proposed by, In this paper, the system consists of sensors to measure the weight of waste and the level of waste inside the bin. Bluetooth is attached for short range communication. The researcherssuggests the method for garbage management which is as follows.

In this paper, Arduino UNO to check the level of garbage filled in the dustbin and sends the alert to the municipal web server once if garbage is filled. After cleaning the dustbin, the driver confirms the task of emptying the garbage with the aid of RFID Tag. RFID is a computing technology that is used for verification process and in addition, it also enhances the smart garbage alert system by providing automaticidentification of garbage filled in the dustbin and sends the status of clean-up to the server affirming that the work is done.

The researchers suggests themethod for garbage management which is as follows. In this paper the system makes use ofArduino Uno board, LCD screen, GSM modem for sending data. The system is powered by a 12V transformer. The LCD screen is used to display thestatus of the level of garbage collected in the bins. Whereas GSM is built to show the status to the user, monitoring it with SMS. The SMS consists of text related to all garbage bins. The LCD screenshows the status of the garbage level. The system puts on LCD screen continuously monitoring of garbage with Arduino board.

The researcher suggests the method for garbage management which is as follows. In this paper the bin was connected with a microcontroller-based system which had IR wireless system with a main central system that shows the current status of the garbage bin. The status was seen on a mobile based web browser with html page by using Wi-Fi. in this system to reduce the cost they used weight sensor and on the sender's side they used a Wi-Fi moduleto send and receive the data. In the end the weight sensor only detects the weight of the garbage inthe bin but not the level of water.

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## III. EXISTING SYSTEM

1) Manual systems in which employeesclear the dumpsters periodic
2) No systematic approach towards clearingthe dumpsters.
3) Unclear about the status of a particularlocation
4) Employees are unaware of the need for aparticular location
5) Very less effective in cleaning city.

## IV. ABOUT SMART WASTE MANAGEMENT

Module descriptionList of modules:

1) Processor
2) Sensors
3) Soft wares
4) DC Motor

### A. *Ardunio UNO*

The Arduino Uno is a microcontroller board is dependent on the ATmega328 (datasheet). The microcontroller in Arduino is Microchip ATmega328P and the Operating Voltage is 5 volts. The Input Voltage range from 7 to 20 Volts and the Digital I/O Pins are 14 of which 6 provide PWM output. The analog Input Pins are 6,and DC Currentper I/O Pin is 20 mA. Direct Current for 3.3V Pin is 50 mA. .The main part is the flash Memory contains 32 KB of which 0.5 KB used by bootloader SRAM for this Arduino has 2 KB and EEPROM of 1 KB with a Clock Speed of 16 MHz.The Length of the Arduino is 68.6 mm With the Width of 53.4 mm having the weight of 25 g . It contains everything expected to assist the microcontroller; essentially associate it to a laptop with a USB link or power it with associate degree AC-to-DC instrumentality or battery to start. The Uno varies from each single going before board in that it doesn't utilize the FTDI USB-to-sequential driver chip. Rather, it includes the Atmega16U2 (Atmega8U2 up to make R2) modified as a USB- to-sequential device.

1) *IOREF:* This stick on the Arduino/Genuino board gives the voltage reference with that themicrocontroller works. Associate in Nursing suitably organized defend will examine the IOREF pin voltage and choose the fitting power source or empower voltage interpreters on the outputs to figure with the 5V or 3.3V.
2) *VIN:* the input voltage to the Arduino / Genuino board once it's utilizing an external power supply (instead of five volts from the USB association or alternative managed power source). We will be able to provide voltage through this pin, or, if providing voltage by means that of the power jack, get to that through this pin.
3) *LED:* there's a worked in crystal rectifier driven by advanced 13 pin. At the purpose once the pinis high in terms of value, the crystal rectifier is on, once the pin is low, it's off.
4) *5V:* This pin outputs a managed 5V from the controller on the board. The board is given power either from the DC power jack (7 - 20V), the USBconnecter (5V), or the VIN stick of the board (7- 20V). Providing voltage by means that of the 5V or 3.3V pins sidesteps the controller, and might damage the board.
5) *Reset:* generally wont to add a reset catch to shields that sq. the one on the board
6) *GND:* This is a ground pin
7) *3V3:* 50mA of maximum current is drawn and on- board regulator generates 3.3 volts of supply

Module Diagram for Arduino Uno Processor

*B. Sensors*

*1) Ultrasonic Sensor:* Ultrasonic (US) sensor is a 4-pin module, whose pin names are Vcc, Trigger, Echo and Groundrespectively. This detector could be a very-about detector utilized This detector could be utilized in several applications wherever mensurationdistance or sensing objects are needed. The module has 2 eyes like accompanies like robot at the front that frames the ultra- supersonic transmitter and recipient. The locator works with the simple secondary school recipe that

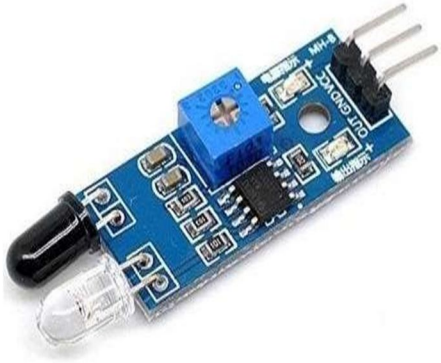
Distance = Speed × Time

The Ultrasonic transmitter broadcast a supersonic wave, this wave goes in air and when it gets questioned by any material it gets reflected back toward the sensor thisreflected wave is seen by the Ultrasonic beneficiary module as appeared in the image beneath Now, to figure the separation utilizing the above recipe, we should know Speed and time. Since we tend to utilize the supersonic wave we as a whole know all inclusive speed of wave at region conditions that is 330m/s. The hardware inbuilt on the module will compute the time taken for the US wave to return and turns on the reverberation stick high for that equivalent specific measure of your time, along these lines we can likewise realize the time taken. Presently just figure the separation utilizing a microcontroller or small scale chip. Likewise, this nondeterministic mapping case (i.e., one-to-manymapping) happens even after we normalize all parameter values to extract the structures of the webrequests and queries.

Since the mapping can appear differently in different cases, it becomes difficult to identify all of the one-to-many mapping patterns for each web request. Moreover, when different operations occasionally overlap at their possible query set, it becomes even harder for us to extract the one-to- many mapping for each operation by comparing matched requests and queries across the sessions.

Module Diagram for Ultrasonic Sensor

*2) IR Sensor:* An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation rather than emitting it that is called as a passive IR sensor.Usually in the infrared spectrum, all theobjects radiate some form of thermal radiations. These types of radiations are invisible to our eyesthat can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received.



Module Diagram for IR Sensor

*3) GSM Module:* A GSM module or a GPRS module is a chipor circuit that will be used to establish communication between a mobile device or a computing machine and a GSM or GPRS system. The modem (modulator-demodulator) is acritical part here. These modules consist of a GSM module or GPRS modem powered by a power supply circuit and communication interfaces (like RS-232, USB 2.0, and others) for computer. A GSM modem canbe a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities. A GSM/GPRS modem is a class of wirelessmodem, designed for communication over the GSM and GPRS network.

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It requires a SIM (Subscriber Identity Module) card just like mobilephones to activate communication with the network. Also, they have IMEI (International Mobile Equipment Identity) number similar to mobile phones for their identification.
A GSM module exposes an interface that allows applications such as NowSMS to send andreceive messages over the modem interface the mobile operator changes for message sending receiving as if it is performed directly on the mobile phone To perform these modules a GSM module shouldsupport an “extended AT command set”.for sending or receiving messages
One of the major application is the flood intimation project is designed to detect a rise in the water leveland convey the message to the concerned authorities by using GSM protocols. As the water level rises from a fixed level, (which can be sensed by using any sensor) the microcontroller gets interrupted.

Gsm module

4) *Moisture Sensor:* Moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighing of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing inhydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.
Module Diagram for Moisture Sensor

*C. Arduino IDE*

The Arduino integrated developmentenvironment (IDE) is a cross-stage application (for Windows, macOS, Linux) that is written in the programming language Java. It is utilized to compose and transfer programs to Arduino compatible boards, yet in addition, with the assistance of outsider centres, other seller advancement sheets. The source code for the IDE is discharged under the GNU General Public License. The Arduino IDE underpins the dialects C and C++ utilizing uncommon guidelines of code organizing. The Arduino IDE supplies a product library from the Wiring venture, which gives numerous normal information and yield methodology. Client composed code just requires two essential capacities, for beginning the sketch and the principle program circle, that are aggregated and connected with a program stub fundamental () into an executable cyclic official program with theGNU toolchain, additionally included with the IDE distribution. The Arduino IDE utilizes theprogram avrdude to change over the executable code into a book record in hexadecimal encoding that is stacked into the Arduino board by a loader program in the board's firmware The primary code, otherwise called a sketch, made on the IDE platform will eventually producea Hex File which is then moved and transferred inthe controller on the board. for composing the required code and later is utilized for assembling and transferring the code into the given Arduino Module.
This environment supports both C andC++

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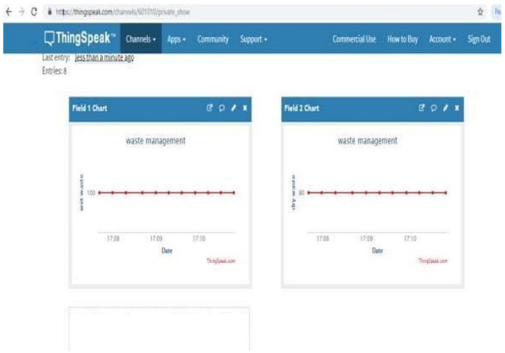
Module Screenshot for Arduino IDE

*D. Thing Speak*

ThingSpeak is an IoT analytics platform service that allows you to aggregate, visualize and analyze live data streams in the cloud. ThingSpeak provides instant visualizations of data posted by your devices to ThingSpeak. With the ability to execute MATLAB code in ThingSpeak you can perform online analysis and processing of the data as it comes in. ThingSpeak is often used for prototyping and proof of conceptIoT systems that require analytics.




Module Screenshot for BLYNK App

*E. Servo Motor*

A servomotor is a linear actuator orrotary actuator that allows for precise control of linear or angular position, acceleration, and velocity. It consists of a motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.There are some special types of applications of an electric motor where the rotation of the motor is required for just a certain angle. For these applications, we require some special types ofmotor with some special arrangement which makes the motor rotate a certain angle for a given electrical input (signal). For this purpose, servo motor comes into the picture.

SERVO MOTOR

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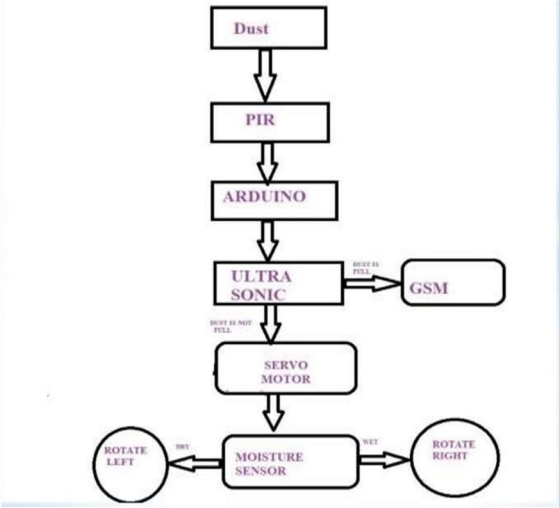
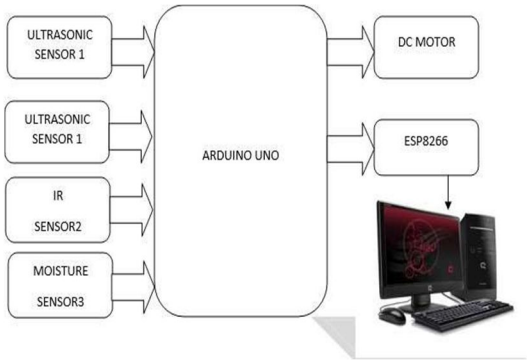
## V. BLOCK DIAGRAM




### *A. Architecture Diagram*




Architecture Diagram for Smart Waste Management System

Here, the figure represents an integration of SmartWaste Management System with a 3-tier sensor processor device system.

*1)* Ultrasonic sensor measure distances by using ultrasonic waves. The sensor emits an ultrasonic wave and receives the reflected wave back from the target.
*2)* IR Sensor emits in order to sense some aspects of the surroundings.
*3)* Moisture Sensor measures the volumetric water content in the soil. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing hydrology and agriculture.
*4)* DC motor which is connected to the digital pins of Arduino
*5)* We are using serial monitor for the display.

### *B. Working*

*1)* When we put dust on the thermocol,the PIR sensor will sense the motion of the dust.And gives them to the ARDUINO.
*2)* The ultrasonic sensor will check whether the dustbin is full or dustbin is to be filled.
*3)* If the Dustbin is full ,then it will send instructionsto the GCM module which will send the alerts tothe authorities.
*4)* If the Dustbin is not fill ,then the soil moisture sensor will come into play.
*5)* The soil moisture sensor will check whether the dust is dry dust or wet dust.
*6)* This soil moisture sensor is connected to the servo motor ,If the dust is dry it will rotate on 90 degrees left.
*7)* If the Dust is wet then servo motor will rotate on 90 degrees right and throws the dust in right side.
*8)* This process continues till the dustbin .

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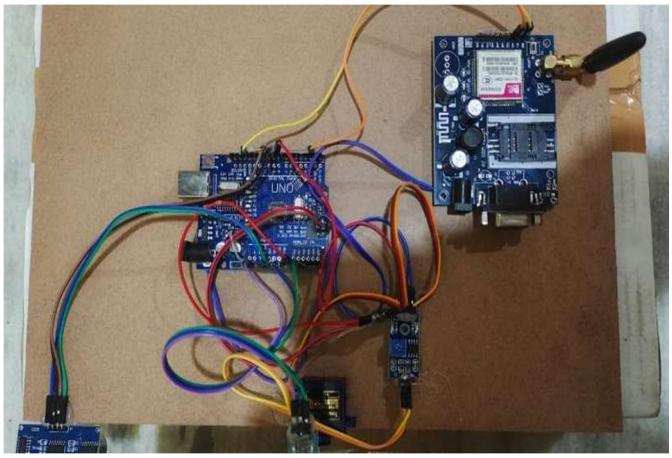
*C. Connections*



## VI. RESULT

The below figure shows the graphical representation of levels of waste in both containersas uploaded to the ThingSpeak cloud. This page can be accessed by any person who has the username and password of the account.

## VII. CONCLUSION

Every project is always has scope for improvement, perhaps the most pressing issue of separation of waste is when their dispose simultaneously. The waste segregator can be improvised to include the separation of paper and plastic, safe segregation of biomedical waste generated at home, compact and aesthetic Mechanical design.

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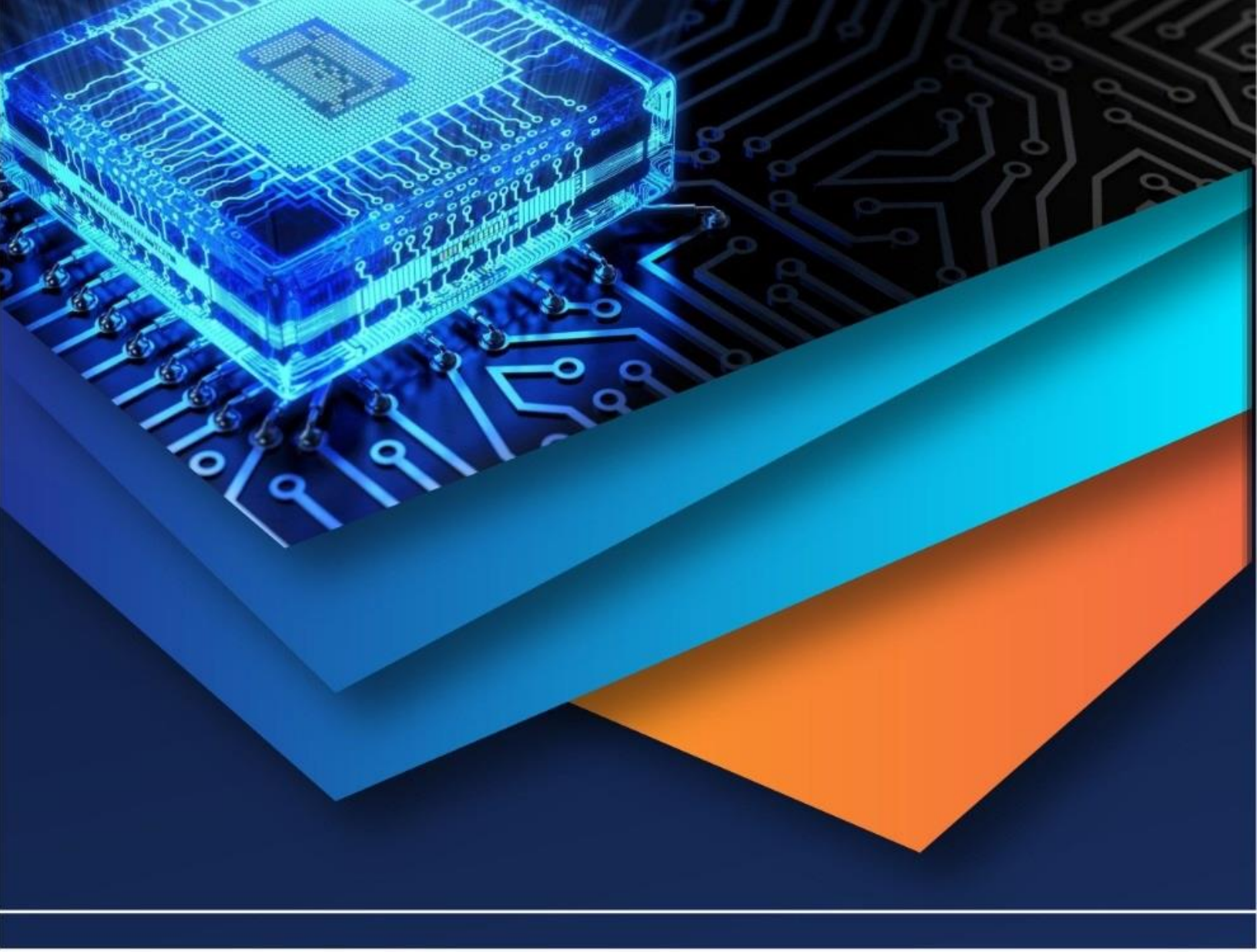

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