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Advanced Smart Cart with Security Features

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Abstract: ***Nowadays, shopping at huge malls is a daily activity in the cities. We can observe large lines at shoppings malls on holidays and weekends. The rush is even more during the festival time, since there will be many offers which attract the people. After completion of shopping, a person must go to the cashier for the billing process. The cashier prepares the bill using the bar code reader that could consume a lot of time and leads to long queues at the counters. Smart Cart helps us to overcome this issue. It uses RFID reader and tags for scanning the products and sends a payment link to the customer's mobile. With the help of this cart, the customer can directly pay the bill with the received payment link and leave the shop with the products he/she has bought after payment verification. This smart cart removes the traditional way of scanning the products by the barcode scanners at the bill counters. And can directly pay the bill without waiting in the queue. With this system the customer can observe the total amount on the LCD screen after adding every item. By seeing the prices he can shop accordingly with the available amount. Since the complete process is done by the machine there will not be any errors. By this smart cart, there will be high security, speed and even the cost is low.It can also replace human labour.***

Keywords: RFID reader, Barcode, Payment

I. INTRODUCTION

Shopping is one of the funniest and happiest activities that we all loved to do in our childhood. As the present world is developing too fast, the needs of an individual are also increasing in a wide range. Every individual spends their part of their time shopping. In order to purchase their needs they need to wait in a queue for a long time. Hence most of them prefer online shoppings, in which the customer can't see the product directly.

We can overcome this problem by efficient use of technologies. As the technology is gradually increasing day by day, people directly or indirectly depend on the technology to complete their work faster. So we wanted to help every individual to save their time in shopping as well. Hence we have come up with an idea called Advanced smart shopping cart with security features.

Hence this prototype can be implemented in supermarkets and shopping malls, where it can help customers in completing their shopping in a short period of time. To overcome all the difficulties faced by the people during the shopping , this Smart cart was developed. There are many papers which come across the advancement of the smart shopping cart. But all those carts are always open. Since the cart is always open the customer can directly place the cart without scanning the product. This leads to theft. In order to overcome all the issues Advanced Smart cart with security features is developed. In the present system, we use RFID tags, Arduino Uno, Keypad, Servomotor, GSM, LCD etc.

In this smart cart, there is an option to pay the bill directly from the mobile. After successful completion of shopping, the GSM module sends the Payment link to the customer's mobile. The customer can directly open the link and pay the bill. This process consumes less time. Even the customer doesn't need to stand in the line for the payment. Customers can directly verify the payment of bills and leave the mall. This overcomes the traditional way of standing in the queue for the billing. Even the labor who work in the shopping malls under the billing sections can be replaced by the Smart carts.

II. LITERATURE SURVEY

Many papers exist on the smart cart. All the existing systems use RFID reader and tags, LCD module, Arduino Uno/ microcontroller and Xbee or bluetooth module for communication. These are the basic components used in the existing papers. The methodology is almost similar. Each and every product in the shop has the RFID tag attached to it. The RFID tag is present to the smart cart.

The selected products are scanned by the reader and then placed into the cart. After the completion of shopping the Xbee or bluetooth modules are used to communicate with the customer for the sending of the bill. As the whole process of automatic payment reduces chances of errors made by the human. This program is beneficial to shopping malls as it can help reduce payroll costs and will help reduce labor. The goal is to design a shopping cart based on a microcontroller that assists customers when purchasing and reducing the queue in the payment calculation area. There are even many application softwares used for payment process and also for displaying the list of items selected by the customer.

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The system also has the feature of removing scanned products to further customer purchasing information. All these carts are always open. Since the cart is always open the person can place the product without scanning by the reader. This leads to theft. In order to overcome this Advanced smart cart with security features is introduced. Since this is not always open, it can reduce theft.

III. EXISTING SYSTEM

The existing system in purchasing department stores is the barcode approach. In this method there are barcode labels on each product which is probably browsed by the barcode readers. A barcode reader is related to digital gadgets for analyzing written barcodes. Like a scanner, it includes a light-weight supply, a lens and a mild sensor translating optical impulses into electric ones. Additionally, almost all barcode readers comprise decoder circuitry reading the barcode's picture information supplied through the sensor and sending the barcode's content material to the scanner's output port. When we are ready to pick any product we buy, we put it in a cart and take it to the treasurer. The Finance Manager scans transactions using a barcode scanner and delivers bills to the North American country. But it turns out to be a slow process where tons of sales are scanned, so creating a payment method is slow. This can eventually lead to long scratches. The current system uses POS payment software. After completion of purchases, one needs to visit the billing counter for bills and look forward to a long time at the billing counter to pay the bill. At the time of sale, the shopkeeper calculates the amount to be paid by the customer, indicates the amount, the customer can prepare an invoice (which can print a cash register) and indicate the customer payment options. Sometimes the waiting can be even 1 to two hours. To triumph over this trouble smart cart can be used.

IV. PROPOSED SYSTEM

In the proposed system, every product in the smart cart has an RFID (Radio Frequency Identification) tag. Smart shopping cart has an RFID reader. After selection of a product the customer needs to scan the product in front of the reader. Whenever the tag is scanned in front of the reader, the cart opens. In this way the customer can scan the products and place them in the cart. After successful completion of the shopping, the payment link is sent as an SMS to the user. The customer can directly open the link and pay the bill and leave the mall.

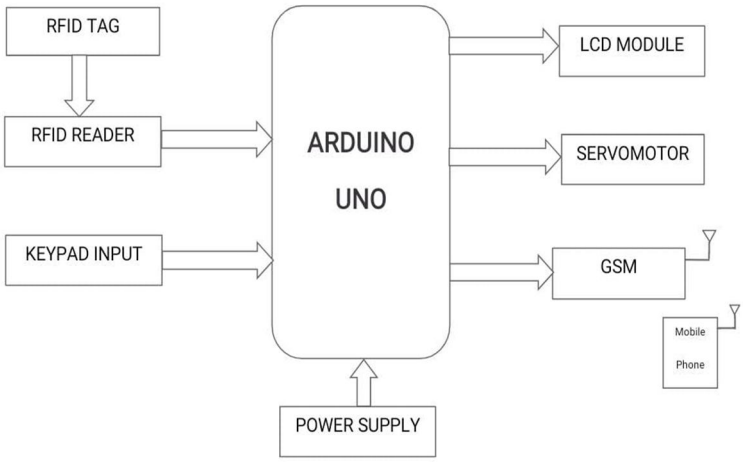


Fig:1. Block diagram

V. METHODOLOGY

Initially each and every component is connected with the Arduino Uno. The code is dumped into the Arduino uno, using the USB cable and 9V battery is connected to the Arduino UNO, Servomotor, GSM. Whenever the power is supplied to the arduino through the 9V battery, the setup method is executed first.

The setup() function is executed only once, that is at the beginning of the sketch. This method is used to initialize variables, start using libraries, set the pin modes, etc. It can not run more than once. It is used only after each powerup or reset of the board. Initially a variable called total is initialised to zero. Then the phone number is taken as input from the keypad. mobile() is a function which is used to take the phone number. It takes the phone number, one digit at a time until the size of the number is 10.Then the LCD displays the mobile number for further verification of the customer.

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The RFID reader checks whether the card is available or not. If the card is available then it compares value with the tag IDs.If the product ID matches with the given Ids then the total value is incremented by the cost of the product and the cart opens, to place the product into the cart. After placing the product , again the cart is closed. This is implemented by the servomotor. A special function called servomotor() is written in the code for opening and closing of cart. The product name, cost of the product and total cost is displayed on the LCD. This process continues till the person shows the end of shopping tag is scanned in front of the reader. When the end of shopping cart is scanned in front of the reader, The LCD displays as the end of shopping with some delay. Then it sends the payment link to the customer's mobile. The payment link is created by Instamojo , in which the merchant's account is linked. GSM module is used to send the SMS. The commands are written in the sendsms() method. Then the LCD displays "Thanks for shopping". Now the customer can directly pay the bill and leave the shopping mall , after his payment verification. After completion of the individual shopping, reset() method is called. This method initializes the total value to zero, removes phone number and clears the LCD display. In this way the cart can be used for multiple customers.

VI. HARDWARE AND SOFTWARE DESCRIPTION

A. RFID Reader and Tags

RFID tags and readers are used to transfer the signal through Radio Frequency Identification (RFID). The RFID reader is an electronic device which contains one or more antennas which continuously emit the radio waves and receive signals from the RFID tags. Each and every tag has the Unique identification ID. Tags use radio waves to communicate their unique identity and to the readers near them. Tags are classified into two types. They are active and passive. Passive RFID tags don't have battery, they get power from the reader. Whereas active RFID tags are powered by batteries.

RFID tags and reader works under electromagnetism. The Passive tags receive power from the reader. The antenna in the tag is a propeller, it attracts the electrical energy from the reader and then enables the tags to transfer the data. RFID reader has 8 pins interfaced with the Arduino Uno. Standard frequency of tags is 125Khz.The connections are made as shown in the below figure.

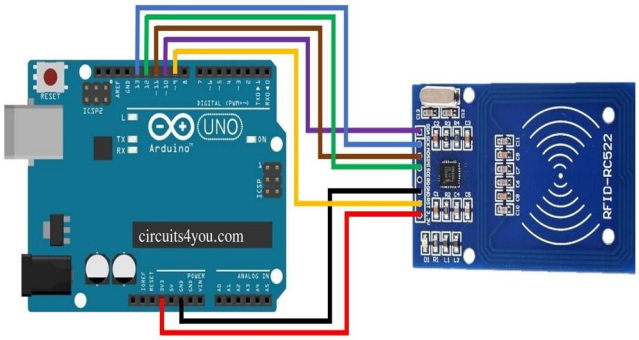


Fig:2.RFID Reader and tags

B. LCD Display

Liquid Crystal Display screen is an electronic display module used in different applications. The size of the LCD module is 16 x 2.There are two rows to display the characters. Each row can have 16 characters. Each letter in the LCD is displayed on a 5 x 7 pixel matrix. Arduino has 8 data bits, two power pins, two ground pins. The 3rd pin of the LCD is connected to the potentiometer, which controls the brightness of the LCD screen. In the project LCd module is used to display the product Scanned by the reader and it also displays the mobile number entered by the user. LCD is interfaced with the Arduino Uno as shown in the below figure.

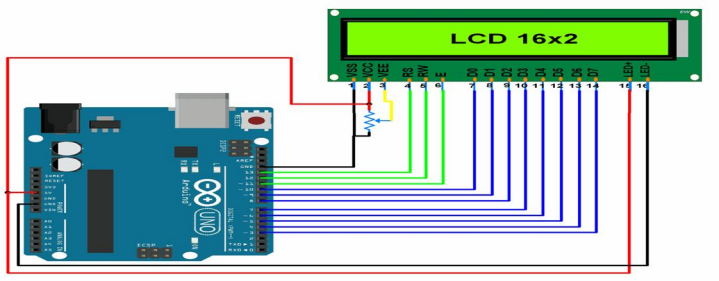


Fig. 3. LCD Display

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C. Arduino Uno

Arduino is one of the important non-proprietary electronics platform where it is easy to use in either ways hardware and software. This electronic board can read any type of inputs like an Instagram message or a signal that is received by a sensor and then converts into a desired outputs. We can also command our board by sending a group of instructions to the microcontroller on the board.Atmel-8bit AVR microcontrollers are used mostly in this Arduino boards. In this series of microcontrollers they vary in amount of flash memory, pins and other features. A 5v linear regulator and a 16 MHz Crystal Oscillators are also used in Many of the boards. These Electronic boards have overall 20 pins and in that Digital I/O pins are 14 in number where pulse width modulated signals can be produced by 6 of them and the remaining six are Analog pins.

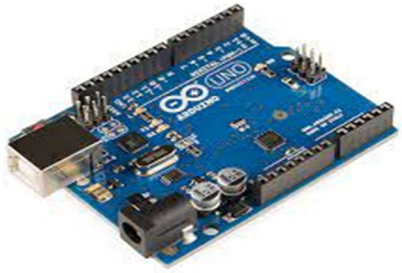


Fig:4.Arduino UNO

D. GSM Module

Global System for mobile communication is a module which is being used as a standard method for mobile phones. This technology can provide a data link to a remote network and this represents today's 70 percent of digital wireless market. Generally this module gets divided into Six sided cells and where each side depends upon the power and load of the dispatcher.

This module performance is with the combination of TDMA , FDMA and frequency hopping. GSM uses two frequency bands of 25MHz where 890 - 915 MHz is the range of frequency for up- link and it is 935 - 960 for down link. This also divides this 25 MHz frequency band into 124 channels. There are 3 different Control Channels for GSM the first one is BCH(Broadcast Channel) and the second is CCCH(Common Control Channel) and the last channel is DCCH (Dedicated Control Channel).

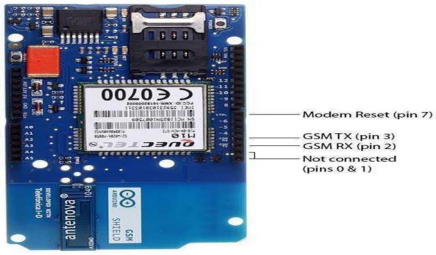


Fig:5.GSM module

E. I2C

The I2C (Inter-Integrated Circuit) protocol to connect to a serial bus interface. The other name for I2C is " TWI " (Two Wire Interface) because it only uses two wires for communication. These are two of the cables, SDA (Serial data) and SCL (Serial clock).The I2C is a consent-based communication protocol, which means that the transmitter controls for the verification of the buyer and the transfer of the data to see if it is a success to be accepted by the recipient. The I2C operates in one of two modes:

1) In Master mode

2) In slave mode

The Serial Clock (SCL): This is the clock signal. The Data will be passed on to other entities, which is based on the events that the clock is ticking. The CLOCK of the master-monitoring only device. Serial port of the Storage of the Data (SDA): This is the serial data link that is used for the exchange of data between the master and slave devices

The Master device initiates communication with the other device. In order to start a call, the address of the slave device is required. The slave device responds to the master device, and when you look at it, they are the master device.The I2C bus is an open discharge configuration, which means they can jump down to the corresponding signal line, but it can keep that out loud. Therefore, the line will go to the unknown parameters.

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F. Servo Motor

A servomotor is a device which rotates 180 in clockwise and anticlockwise direction with high speed. A sensor is being used to control the position in this motor. Servomotors generally use potentiometer as a device for sensing. It works as The Servo motor will automatically be waiting for a while, every 20 milliseconds (ms), and for the duration of this moment, is going to determine how much of the engine's rotation. For example, 48 presses it for 1.5 ms causes the motor to rotate by 90°, for example, if the pulse is short, 1.5 ms, the shaft passes through 0°, and it is 1.5 ms, and it is going to rotate the servo to 180 degrees.

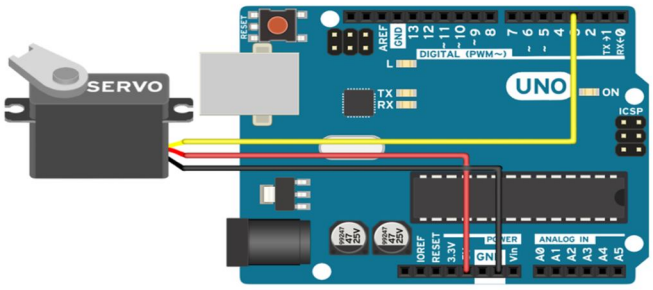


Fig:6 Ardino with servo

VII. SOFTWARE REQUIREMENTS

A. Arduino IDE

Arduino IDE is the open source platform .It is used to program the Arduino board. The Arduino Integrated Development Environment has a text editor to write the code, a Serial monitor, a text console, a toolbar with different options for different functions and a series of menus. It can also include many libraries as per the requirements. This IDE has an option to compile the code. After compiling the code, An USB cable is connected from the laptop to the arduino board. Then Click on upload the code. This uploads the code in Arduino UNO. A text editor similar to a manual with various features. Shortcut platform software available throughout Operating Systems such as Linux ,windows etc. The Languages used to code are C/C++.Arduino IDE has Window bar, Menu bar, Text editor, Output Panel, Shortcut buttons.

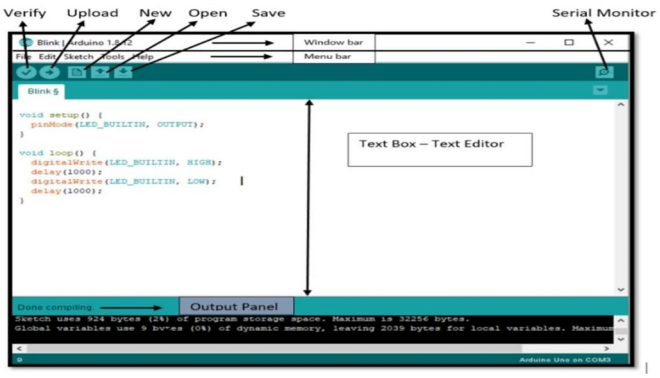


Fig.7 Arduino IDE

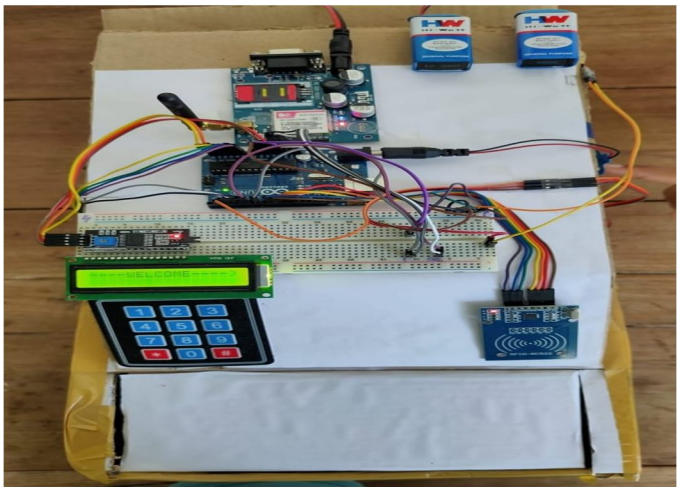
B. Instamojo

Instamojo is the easiest online marketing platform in India, where they are a small, independent businesses, MSMEs and start-ups, e-commerce and online payment solutions that help them to run their business in a successful manner. This is a person who can create his / her own account, such as a company or as a consumer. The seller creates a new account, use Instamojo online payment processes ,you can create a payment link by using two different methods. For the first one, this is the best shift, and other Smart link. The first way is how many of the names that will appear is a quick process, and you just need to observe what is the purpose of the payment, as a gift, the gift of the purchase or payment, you must enter the minimum number of customers that you need in order to do so, and then click the Create button. So in the end, a link will be generated for you, and you are able to find the option to share the link. However, in the links you will find a lot of options to set up the link to which the seller would have.

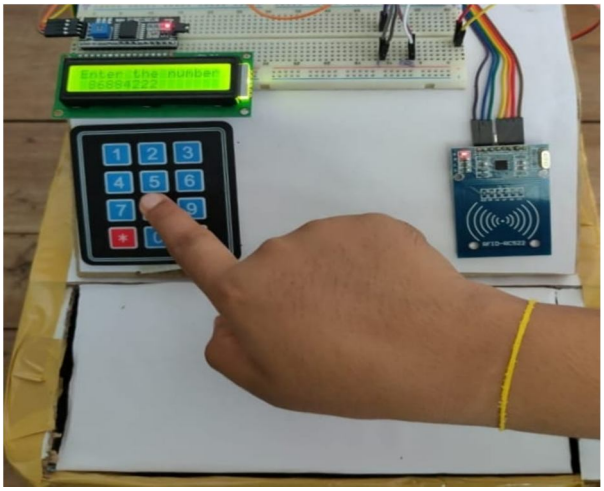
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VIII. RESULT AND ANALYSIS

Step 1: Welcome to the shop



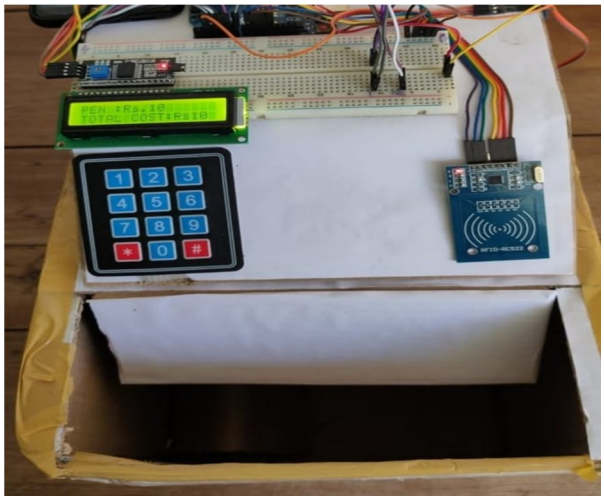
Step 2: Enter the mobile number



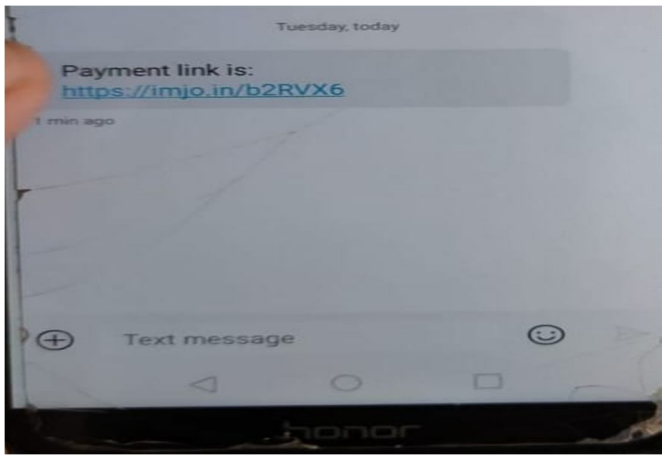
Step:3. Scanning the product



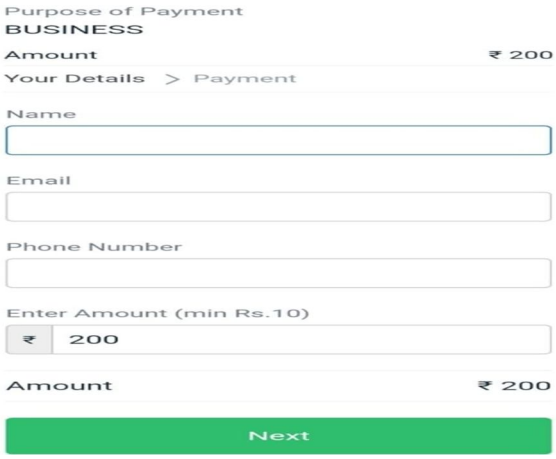
Step:4.Cart opens



Step:5 Message received by the mobile



Step:6. Payment process



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IX. CONCLUSION

By this project, we aim to transform the payment process, build it faster and increase security using the RFID process. The cart has a mechanical calculation feature and shows the total cost of all the products inside it. This makes it easier for the client to understand what amount to pay at the time of purchase and not on exit.Since the cart is not always open, the cart opens only when the product is scanned.The customer can pay the bill directly using the payment link and take the goods purchased after the payment verification. It removes the existing method of scanning the products using the Bar codes technique at the counter.And the time taken for the entire process is also reduced. People don't need to wait in the queue for billing.The proposed system is highly secure, reliable and time saving. There will be a reduction in the salaries of employees, a reduction in theft.

A. Applications

1) Shopping malls
2) Libraries
3) Super markets

X. FUTURE SCOPE

This smart cart is just the basic model of the smart shopping trolley. This can be extended by adding many features and developing a prototype. In this cart, the product once added can't be removed. To overcome this issue, one can keep an option to remove the product after it is added. The individual weights of each item placed in the cart can be calculated by adding the weight of the product along with the cost of the products. We can add any element to remove the products, after adding them to the cart. By using artificial intelligence, we can also maintain the database of the products in the shop and also the camera module can also be placed inside the cart in order to develop a prototype.

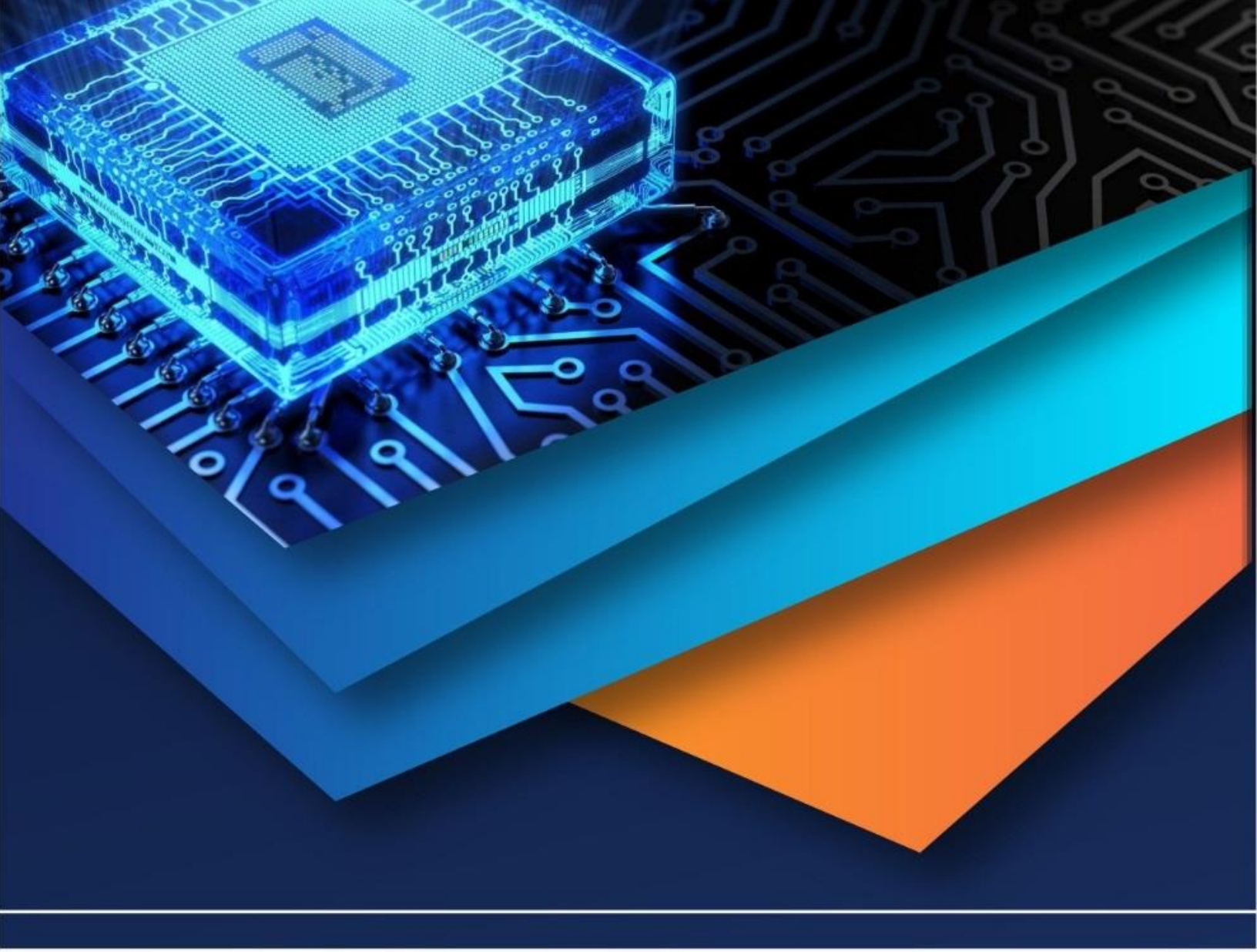
XI. ACKNOWLEDGMENT

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