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Automated Electricity Control

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Abstract: ***Automated Electricity control with Arduino is a circuit used to achieve three tasks I.e., 1) to accurately count the number of students in a room, 2) to display The total number of people in the room on the LCD 16X2 module, And 3) to automatically turn off the electric appliances in some regions in the room where no people are there, we divide the the room in to n number of regions ,when a person enters into region 1, then the appliances in those area only turned on , when he moves from this region to another region the appliances in the first region will turned off automatically, thus the regions in which people are present only uses the electricity the unnecessary wastage of electricity would be drastically decreased, this could be implemented in big shopping malls and function halls, seminar halls etc.. when everyone leaves the room all the electric appliances will be turned off automatically. The microcontroller performs the task and receives signals from sensors, and these sensors are controlled by software stored on the EEPROM of the Arduino. this project will help reduce energy losses. This project can be implemented in a wide range of applications , where the area of rooms are very big and the electric appliance are arranged every corner of the room which is contributing of lot of electricity wastage.for Example At my university, I discovered that the lights and fans turn on even when no one is in the room. To avoid all these situations, this project was developed. When everyone leaves the room, the counter is reset to zero, turning off all lights and fans. You can avoid proxy attendance by cross-checking with the counter. .***

Keywords: attendance monitoring, automation, LCD module.

I. INTRODUCTION

The main motive of this project is to reduce the wastage of electricity due to the negligence of people , and reduce Man power involved in robotic jobs such as counting the number of people inside a room, and with the advancement of technology, there are more and more electric appliances being designed everyday for interior designs and they end up consuming lot of electricity, in big houses, shopping malls and conference halls they are basically very wide and the people sit in one corner but still all the appliances in the room are being turned on, though it is not needed, so by detecting the corners/ regions in which no person is present and turning off the appliances where nobody is present , would be a perfect solution to curb this wastage of electricity.this project will also have applications in which people are responsible for counting the number of students taking the bus, attending a session, and returning to college each time you go out to picnic at school. counting and taking care of all this is becoming difficult, and executives face a dilemma when we go to meetings in conference rooms or seminar rooms. Is the room full or are there any vacancies we can get inside? Also with the upsurge of covid 19, there are places where the social distancing must be maintained very strictly such as big malls, shops, and government offices where only fixed number of people should be allowed inside the building each time, so if we use a man to do all this that is basically a manpower wastage and people tend to get corrupt. So, we decided to simplify the task and develop a prototype that helps people in the above situation, our project is simpler and easier and no time is wasted. from the past to the present, there is a constant demand for automatic devices. When living standards rise, there is a sense of urgency to develop a plan that will alleviate the complexities of life. The main concept of this project is to count and show the number of people entering the conference room,through the LCD screen kept at the entrance of the room.

II. LITERATURE SURVEY

Traditionally, many types of systems have been implemented to count the number of people entering and leaving a room to deal with energy losses. Some include density-based measurements, others include imaging processing and thermal sensors. All of these methods are very expensive to use, or sometimes very inaccurate, so we use IR sensors to overcome these hurdles.the IR sensor is well suited for this purpose because of its accuracy and low cost.

1) *Existing System:* The traditional method implemented with IR sensor has the disadvantage that it has two infrared sensors. One is used for counting the persons entering the room and other sensor is used for counting number of people leaving the room. when the detector inside the room detects someone in front,counter increments and considered as someone entered into the room, when the sensor outside the room detects the presence of someone, this event is referred to as the person entering the room. Considering the biggest downside to this experiment is that the system considers you to be entered into the room when

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you just keep your hand in front of the first sensor, even if you do not physically enter the room. so the systems which are in existence can be easily mislead by the people. To overcome these shortcomings, we proposed a solution.

III. PROPOSED SYSTEM

In our proposed system, the system cannot be mislead by the people because our project increments the counter if the person is physically entered into the room just keeping hand in front of the sensors does not increment or decrement the counter. This can be achieved by using the information from two infrared sensors for both the entry and exit cases.

So in the code, the information sent by both sensors will be used with a certain delay. In general when a person enters into the room, the person first appears in front of a sensor kept at outside of the room, then in front of the sensor kept inside, similarly when a person comes out of a room he comes in front of the sensor kept inside the room then he come infront of the sensor kept outside.by using this basic trick, literally it means that the both the sensors give information to the arduino with certain delay . the delay is the time taken by the person to cross the door. Since arduino uses the information given by both the IR sensors in both cases, if a person keeps his hand in front of the IR detector there is no error when incrementing or lowering the counter, so our technology counts the persons as exactly as possible that is there is no misleading of IR sensors.

So if someone puts their hand in front of the sensor, this increment or decrement the counter because aurduino is waiting to receive information from another sensor. So there are no errors when the counter is incremented or decremented.

Our project also includes detection of regions inside the room where no people are present but still the electric appliances are being turned on, for this we assume diving the room into some number of sub parts , for example if the pir sensor can cover the area of 10 square meters and the entire room is of 100 square meters then we need to arrange 10 pir sensors in the room to cover the entire room, thus we name the areas covered by the individual pir sensors as region 1, region 2..... region n, thus the regions in which the electric appliances are using electricity unnecessarily will be detected easily.

IV. HARDWARE AND SOFTWARE DESCRIPTION

A. Hardware Components

The components that we require for designing the system are of few sensors and controllers like:

1) Arduino uno

Fig.1.arduino uno

The Arduino Uno is an open board micro controller based on the ATmega328p. There are 14 digital I/Os (6 of which can be used as PWM outputs), 6 analog inputs, 1 UART (serial port), 16MHz crystal oscillator, USB connection, power connector, ICSP head. It contains everything you need, to support your microcontroller. You just need to connect your computer with a USB cable, connect the AC adapter to DC power, or connect the battery to the boot. Depending on software control (using pinMode(), digitalWrite() and digitalRead() functions), all 14 digital pins and 6 analog pins of Uno can be used as inputs or outputs. It works at 5 volts. Each pin can deliver or receive 20mA under recommended operating conditions, and its internal resistance (disabled by default) is varied between 20-50kΩ. To avoid irreparable damage to the microcontroller, do not exceed the maximum value of 40mA on all I/O pins. The section has 6 analog inputs labeled A0 to A5. Each provides 10-bit resolution (i.e. 1,024 different values). You can use the AREF pin and analogReference() to change the upper range limit, but by default it can provide 5V.

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2) Infrared Sensors

Fig.2.infrared sensor

Infrared sensors are devices that contains one transmitter and one receiver, one emits infrared radiation and the second one receives them.when the sensor is turned on, the ir transmitter continuously transmits the ir radiation when any obstacle comes infront of the sensor the radiation hits the obstacle and gets reflected back to the receiver so this mild ir radiation would be detected by the receiver and this signals will be sent to the arduino. The ir sensor contains two pins namely out, ground, and Vcc. Vcc is used to give power to the ir sensor, and out is the pin which gives signals to the arduino.

3) LEDS

Fig.3.LEDs

LEDs are the basis for optical semiconductors that emit light when an electric current flows through them. There are diodes that emit a light source. There are different types of LEDs in different colors. The LED has two terminals, positive and negative, operating at 3-4 volts. In our project these LEDs indicate the electrical appliances.

4) Bread Board

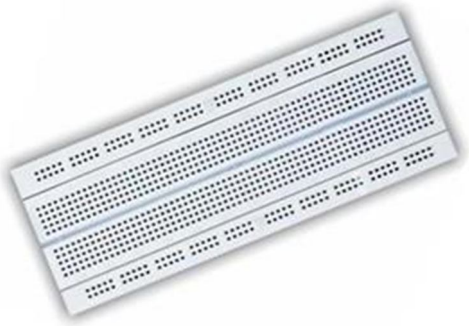

Fig.4.Bread board

A breadboard is a board used to test electrical circuits before being soldered to a vector board. This is done to reduce the cost of the circuit. The breadboard has vertical and horizontal pins for serial and parallel connections. After successfully testing your circuit or prototype, you can solder it to the vector board. The sensor can be connected to the panel, where external connections can be made using shackles or fixed wires.

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5) 16x2 LCD Module

Fig.5.LCD-16x2

LCD modules are often used for most portable activities due to their modest cost, low price and developer friendliness. Most of us come across these presentations in our daily life on PCOs or small computers. Now that the shape and design of the pin has been effectively presented above, let's look at the technical part.

In fact that; It has 16 columns and 2 rows. Various mixing options are available, such as 8 × 1, 8 × 2, 10 × 2, 16 × 1, and more. However, the most common is a 16 × 2 LCD display, so there are a total of (16 × 2 = 32) 32 characters and each character will be 5 × 8 pixels. Currently, each character (5 × 8 = 40) has 40 pixels and 32 characters has 1280 pixels (32 × 40). Also, the LCD monitor should report the pixel position as well. Then I do everything hard with the MCU, so an IC interface like the HD44780 mounted on the back of the LCD module itself is used. The function of this IC is to receive commands and data from the MCU and interact with them to display important information on the LCD screen.

Specifications

a) Operating voltage 4.7V to 5.3V.
b) Power consumption is 1mA without backlight.
c) Alphanumeric LCD module, i.e it can display letters and numbers.
d) Consists of two lines, each line can print 16 characters.
e) Each character is a 5 x 8 pixel rectangle.
f) Can work in 8 bit and 4 bit mode
g) It can also show all symbols created by the user.
h) Can be used with green and blue back lights.

6) 16x2 PIR Sensor

Fig.6.PIR sensor

A passive infrared sensor is an electronic sensor that measures the infrared light radiating the objects in its field of view as they most often used in PIR sensors are commonly used barely in the PIR-based motion detectors PIR sensors are commonly used in the security alarms and in lighting applications they can detect the generic movement but they cannot give information on eho or what is moving A PIR sensor can detect changes in the amount of infrared radiation impinging upon it, which varies depending on the temperature and surface characteristics of the objects in front of the sensor.[2] When an object, such as a person, passes in front of the background, such as a wall, the temperature at that point in the sensor's field of view will rise from room temperature to body temperature, and then back again, The sensor converts the resulting change in the incoming infrared radiation into a change in the output voltage, and this triggers the detection. Objects of similar temperature but different surface characteristics may also have a different infrared emission pattern, and thus moving them with respect to the background may trigger the detector as well.PIRs come in many configurations for a wide variety of applications. The most common models have numerous Fresnel lenses or mirror segments, an effective range of about 10 meters (30 feet), and a field of view less than 180°. Models with wider fields of view, including 360°, are available, typically designed to mount on a ceiling. Some larger PIRs are made with single segment mirrors and can sense changes in infrared energy over 30 meters (100 feet) from the PIR. There are also PIRs designed with reversible orientation mirrors which allow either broad coverage (110° wide) or very narrow "curtain" coverage, or with individual segments to "shape" the coverage.

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B. Software Requirements

1) Arduino IDE

Fig.7.Arduino IDE

This is the open source platform used to program the Arduino. The Arduino Integrated Development Environment (IDE) is a step-by-step application (for Windows, macOS, Linux) written in C and C++. It is used to organize and deliver projects for Arduino's viable dividends, as well as other vendor enhancement sheets with the help of third-party centers.

V. WORKING

The below block diagram essentially shows the working of the project where in different parts are associated with Micro Controller and different sensors are associated with it.

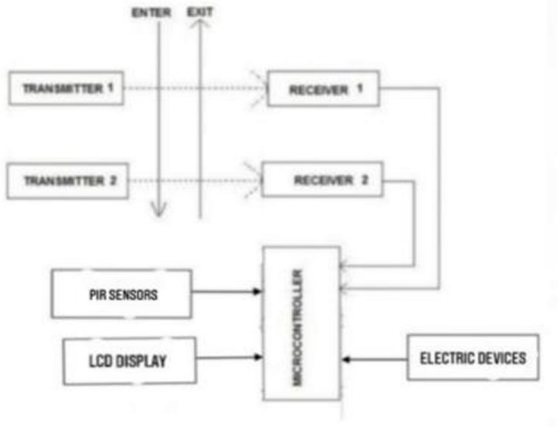

Fig.8.Block Diagram

This project is based on the interaction of an Arduino micro controller with several components such as sensors,electrical appliances, etc. this counter can count people in both directions. This project can be used to count the number of people entering the classroom at the entrance by incrementing, the number of people leaving the classroom by decrementing the counter. The same sensors would be used to monitor the entry and exit.the pir sensors would depict the region in they are set up at thus giving identity to different regions of the room.

This project basically contains 3 sections they are monitoring section, display section, sensing & controlling section

When someone enters the room, the object causes disturbance in front of the first IR detector, then the second detector is disturbed, and the counter is incremented. When a person leaves the room, the second sensor turns on first, then the first sensor turns on, and the counter is decremented. After entering into the room and sitting any place he would be coming under the interference of any one of pir sensors arranged inside the room thus the light in that region would be turned on , when moves into another region then the light in that new region would be turned on and the light in the first region would be turned off within 5 seconds.

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A. Monitoring Section

In this section, we used two IR sensor modules, both are kept at the door, one is kept inside the room and another one is kept outside of the door. The ir sensor give inputs to the arduino when any person comes infront of it. That is the ir radiation will be reflected by the human body. Lets name the ir sensor kept outside of door as sensor 1 and the sensor kept inside the room as sensor 2.based on the order In which the two ir sensors give inputs to the arduino the arduino will decide if the person is entered into the room or exited the room. To elaborate clearly when a person is entering into the room he first comes in front of the sensor which is kept outside of the room and then he comes in front of the ir sensor which is kept inside the room, thus arduino receives signals in the order of sensor 1, and sensor 2. similarly if he exits the room the order would be sensor 2 and sensor 1. If the person entered into the room the counter would be incremented by one and if he exits the room the counter would be decremented by one.

B. Display Section

The display section includes a 16x2 LCD. this lcd display shows the number of people present inside the room.

C. Sensing & controlling Section

This sensing section includes the pir sensors which are arranged inside the room. These pir sensors depicts the number of regions present inside the room. When a person comes in a region the pir sensor arranged in that region would detects his presence and give this information to the arduino eventually the arduino will turn on the lights in that region when he moves into another region then the lights in that region will be turned on and the light in the first region would be turned off within 5 seconds.

VI. RESULTS & DISCUSION

A. Output

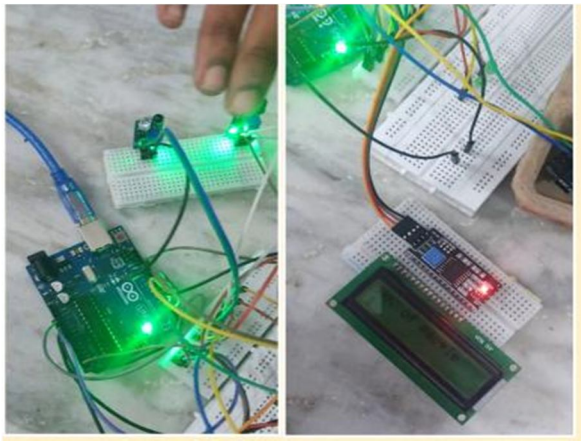

Fig.9.When a first person enters the room the lcd display shows no.of people in the room as 1.

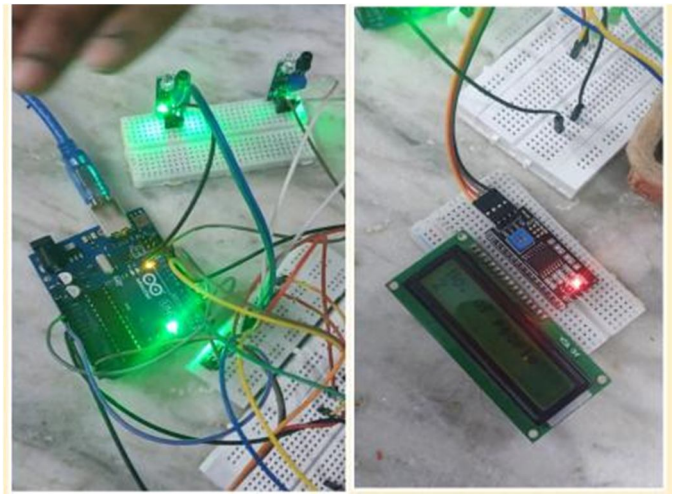

Fig.10.When second person enters the room the lcd display shows the number of people inside the room as 2.

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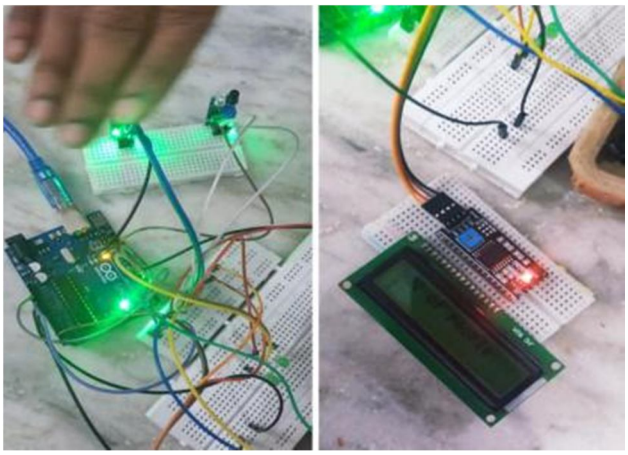

Fig.11.When first person leaves room the lcd display shows the number people inside the room as 1.

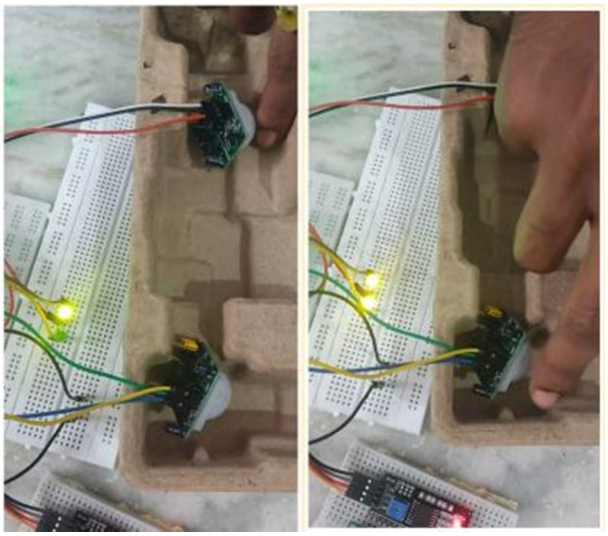

Fig.12. When first pir sensor detects the presence of a person led bulb is turned on Part 2 of the picture depicts when he moved from first region to second region light in the second region is turned on.

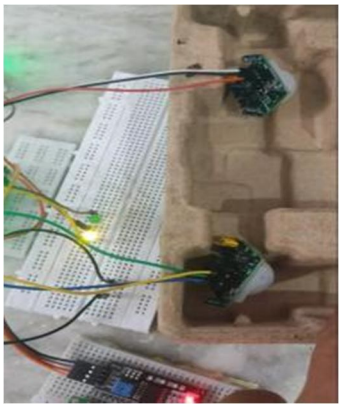

Fig 13. The led light in the region 1 is automatically turned off because the person moved to the second region

Through this project we can make the monitoring techniques more and more accurate and efficient without having to go for highly costlier technologies such as image processing etc, electricity wastage would be reduced considerably, the man power involvement in robotic jobs would be decreased. This framework will diminish the manual endeavors.

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VII. ADVANTAGES

This particular system has following advantages:

A. There are no loopholes in the monitoring system due to renewed code in our project.
B. Man power can be reduce.
C. The electricity would be saved substantially.
D. The designed system is not bulky.
E. Low cost dont involve much complex technologies.

VIII. CONCLUSION

We have proposed a practical and accurate system for automated electricity control.to monitor the number of people inside the room and to control the wastage of electricity. In today's world, there is continuous need of automatic appliances which will increase the standard of living and there is a sense of urgency for developing circuit that would ease the complexity of life. Also if someone wants to know the number of persons present in the room so as not to have congestion, the circuit prove to be helpful.

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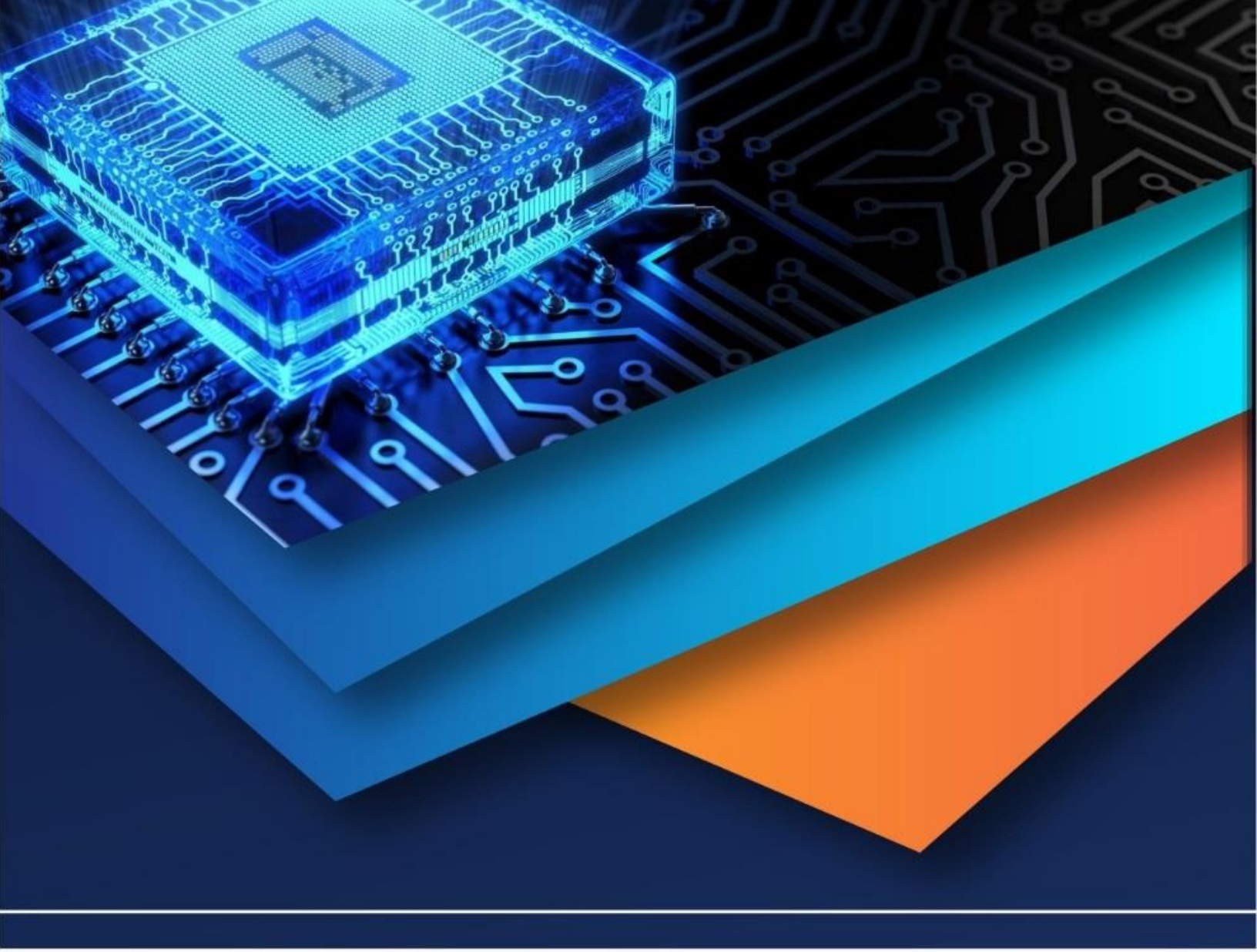

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