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Development of Power Line Communication System for Residential and Industry Monitoring

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Abstract: ***In this paper, Digital data is transmitted and gotten through power lines and an attempt is made to build up a cost effective system which is utilized for two way communication with residential and industry monitoring. Power line communication utilizes existing infrastructure to transmit the data from transmitter to the receiver and the other way around. PLC utilizes power lines as communication media. The digital data is transmitted through AC electrical cables and it is two way communications so it is predominantly utilized as a part of ventures to control a few devices and for security reason. In smart grids this system is used to transmit the huge data from one point to another. In this, PLC modem is utilized which is specifically associated with 230v AC electrical cables to transmit the data and then receiver receives the data from lines and is displayed on screen. The advancement is done usingARM-LPC2148 and programming is done using kiel software.***
Keywords— ARM-LPC2148, PLC modem, Power line communication, Kiel Software.

I. INTRODUCTION

Building automation and data communication are now a day very widespread in industrial areas. In order to reduce the amount of power usage in residential and industrial areas, PLC system is developed which is cost effective and user friendly. PLC system provides energy monitoring and control information to the users. We can monitor and controls the whole apartment and industry by sitting at one place using this system. This system also provides two way data communication.

PLC is communication medium between transmitter and receiver and it is otherwise called as power line channel. In this, power lines are used as communication medium[2] through which digital data is transmitted. This is mainly helpful in smart grids where large amount of data has to transmit at a time through power line. Data communication can be done from one PC (computer) to another using existed power lines[1].

Every electrical appliance are connected to power lines in all buildings so using that existed power lines, data is transmitted from one place to another. Without any extra lines and any wireless technologies, data communication is achieved. Industrial monitoring is big challenge so this paper describes about the development of cost effective system to monitor and control the industrial devices like fan light etc. The main scope of this is to implement digital data transmission in AC main power line, to implement the two way transmission, to implement temperature sensor has to sense send data to monitor session through power line, to develop the Server side control ability of client end devices and to develop devices has to active based on sensing the data.

II. BACK GROUND

In recent years, technology is improved, it is utilized by society, our interest for power is also increased at erratic rates. Infact regularly control organizations are confronted with the test of appropriating force through their energy systems without disturbing the stream of power to different clients. The PLC system is developed which utilizes electrical cables to transmit electrical power as well as for data communication and automation purpose.

PLC has been around for a long while, however has just been utilized to narrow band applications of public lighting. Broad band Power line just started toward end of the1990s and is utilized for automation [4] and data transmission in this paper. PLC has large, medium and short range power cables. PLC is of two types, narrow band and broad band. In this system, broadband over PLC is utilized since the data rate of this band is more and speed of communication is additionally more.

This system provides real time values and saves electricity.It can also be used in nuclear power stations where it is hazardous for humans to work in and requires largedata transmission between nodes. In spite of the fact that its utilization is venturing into the industrial region [5] for controlling the load and also to control light.

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III.METHODOLOGY

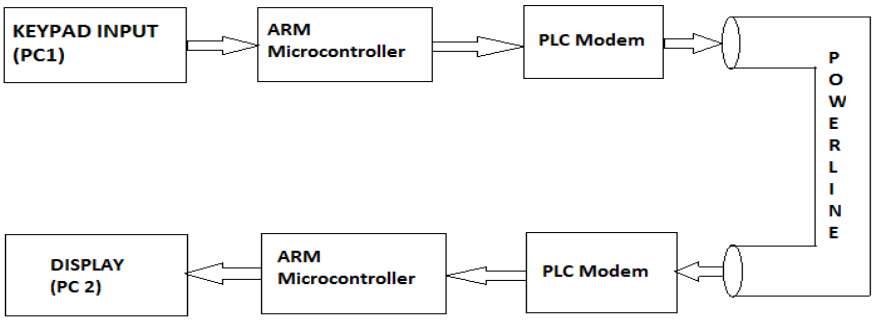

Figure 1: overview of data communication

The main objective is to transmit digital data over the existed power cables and to eliminate the wireless technology sothe PLC is developed which is existed technology [6] and cost effective. The overview of data communication is as shown in fig1. ARM LPC2148 is the main component of this system.Data transmitted by PL is encoded and then passed to receiver [3]. The input will generated by keyboard of PC1 and it is send to microcontroller and it is converted to TTL logic using Max232 and is transmitted to power line modem using RS232 serial port. Power line modem is directly connected to AC power lines through which the data is transmitted and at the receiver side the same circuit is build which consists of PLC modem and microcontroller. PLC modem at receiver receives the data from power lines and is send to microcontroller where decoding of data takes place and the original data will be displayed on screen of PC2. The same process can be achieved from receiver to transmitter because it is two way communication.

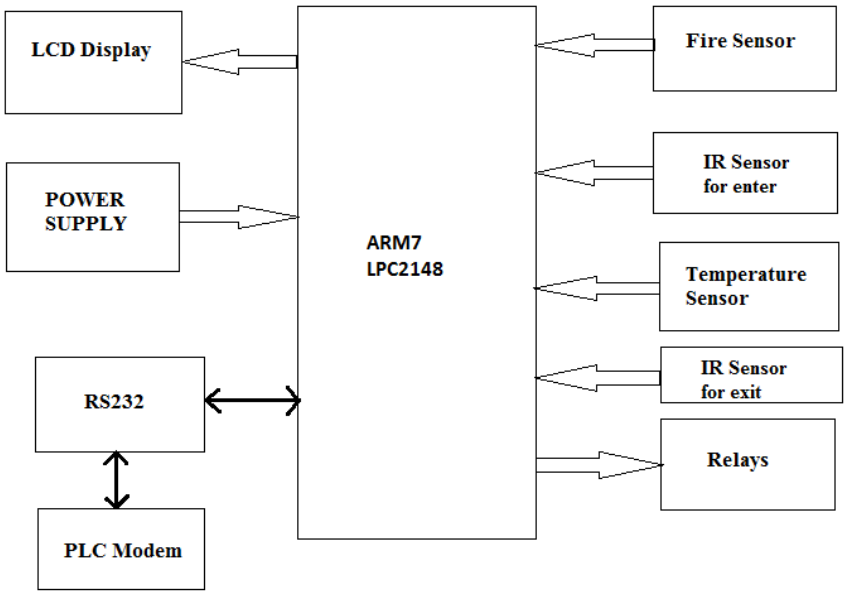

Fig 2:Transmitting part of system

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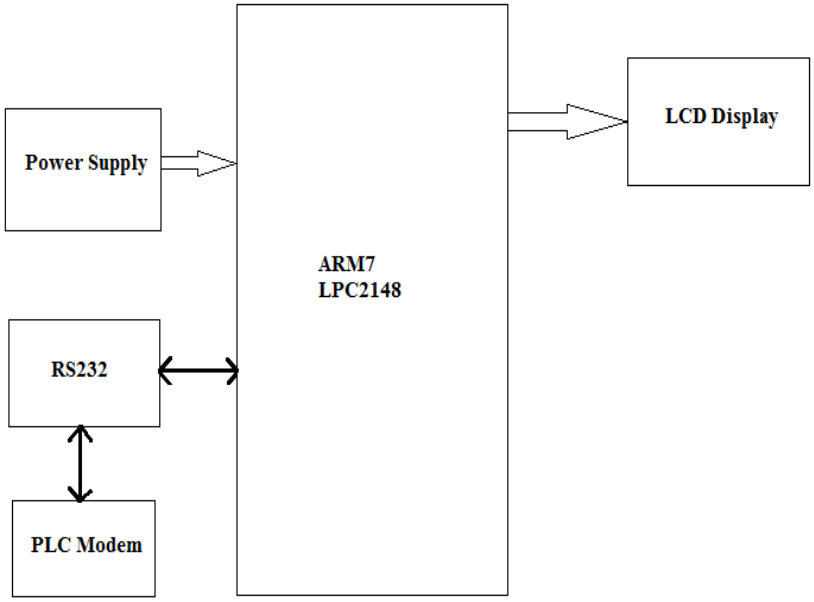

Fig 3:receiving with controlling part

The PLC system consists of two units. One is transmitting unit another one is receiving unit. Both the units consist of ARM LPC2148, LCD display and PLC modem. Transmitting unit consists of temperature sensor(LM35), IR sensor for person enter and person exit, fire sensor.

The ARM LPC2148 is the main component in system which is operated at 3.3v power supply. ARM is four times faster than 8051 microcontroller so ARM is used to design this system. And accuracy is more compare to other controllers. The power supply circuit for ARM is designed which means normally we have 230v ac supply but microcontroller works at 3.3v dc. In order to reduce that, step down transformer is used which reduces the voltage of 230 v to 5v. rectifier then rectifies and produces pulsating DC and capacitor filter circuits removes the noises and then 783.3 regulator regulates the signal and produces 3.3v supply to the controller. And ARM is programmed by using Embedded C language and Kiel software.

When fire is detected, leads to huge loss in industries or in residential areas. In order to avoid that, fire sensor is used which detects the fire and send data to ARM controller. Controller already coded so automatically buzzer turns on and send the data to remote control. When IR sensor detects the person enter inside the room, automatically light switch turns on. Another advantage is we can calculate the number of persons enter into the room. It is also helpful in industries to know how many employees enter inside the office. When IR sensor for person exit detects the person exit from room automatically light switch turns off. It depends on the entered count. If number people entered into room is equal to exit then light switch turns off else it remains on because if one person exit means another person stay inside the room itself. And the data is send to receiving unit. When temperature sensor sense the room temperature, if it exceeds the threshold level then automatically fan turns on or if it is below the threshold level then fan turns off. These data will be transmitting to receiver unit through PLC modem. The PLC modem is directly connected to transmitter and receiver pins of microcontroller through RS232. Max 232 converts those data into TTL logic and send to PLC modem. The data is encoded and modulated at PLC modem and is transmitting through AC power lines to the receiver unit.

At receiver unit, the data from power lines are received by PLC modem where the decoding and demodulation of data takes place and is passed to microcontroller. Then the original data will be displayed on PC2 and LCD. We can also control the devices at transmitter unit like fan switch from receiving unit by selecting the input at receiver side through keyboard of PC2. That is the controlling is bidirectional[4].

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IV. FLOW CHART

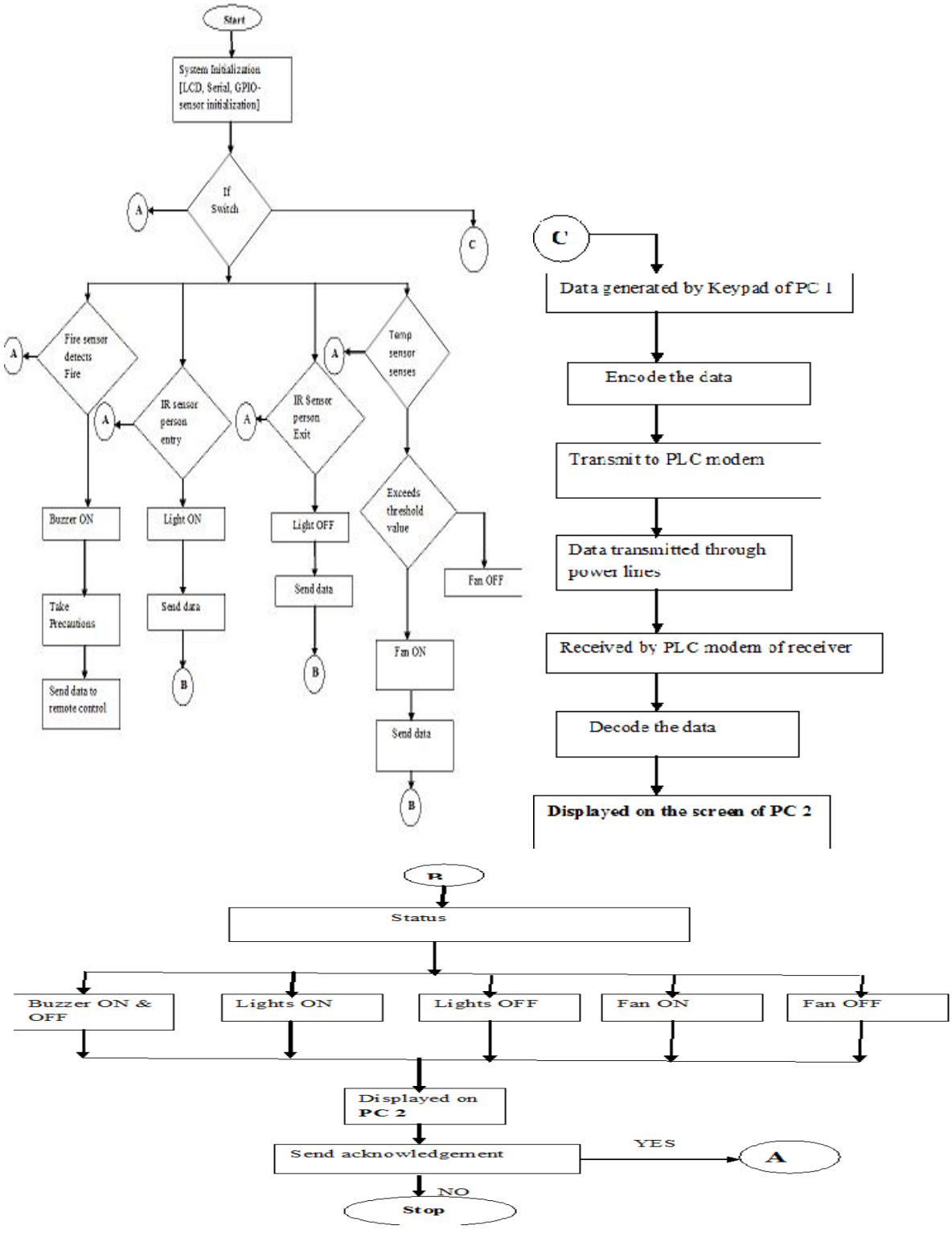

Figure 5: Flow Chart

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V. RESULTS

Data is transmitted from PC1 to PC2 is as shown in below result. The input data is generated by keyboard of PC1 and is displayed on PC2.

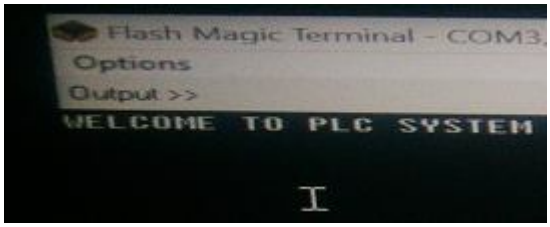

Fig 5: PC to PC communication

When person enter inside the room, IR sensor detects and automatically light turns on and output will be displayed on PC as shown

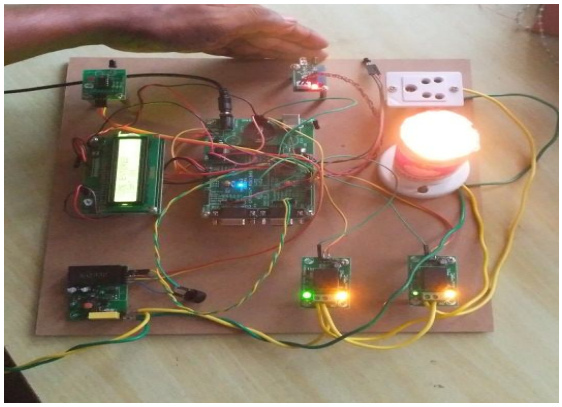

Fig 6: IR sensor detects the person entry

When IR sensor detects the person exit from the room, automatically light turns off and it will be displayed on PC and when fire sensor detects the fire, automatically buzzer turns on and corresponding remedies are taken by authority and the data is send to remote control. The fire detection information and person exit information is displayed on PC as shown below.

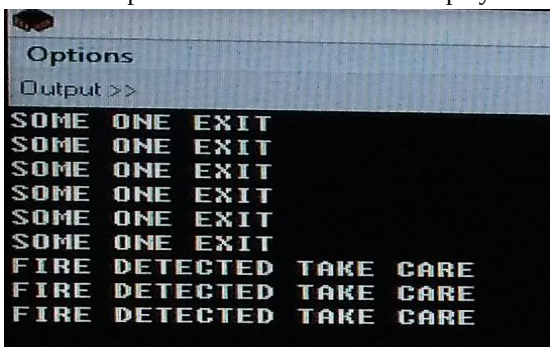

Fig 7: output of IR sensor for person exit and fire sensor

When temperature sensor senses the current room temperature, if it is greater than threshold value then automatically fan turns on. If the temperature is less than threshold value, fan turns off and the information is displayed on LCD.

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Fig 8: Temperature sensor senses the current room temperature

VI. CONCLUSION

Power line communication is one of the techniques that transmit the data over the power cables which is present in industries and every buildings. In this paper, we can know the operation of modem and working of this system and how data can be transmitted without any networks and gained the knowledge of transmitting data through power lines. It also provides the amount of power utilized by the devices. So that we can calculate the money have to pay for government. It is mainly used in smart grids and nuclear power stations where there is heavy data transmission between the points.

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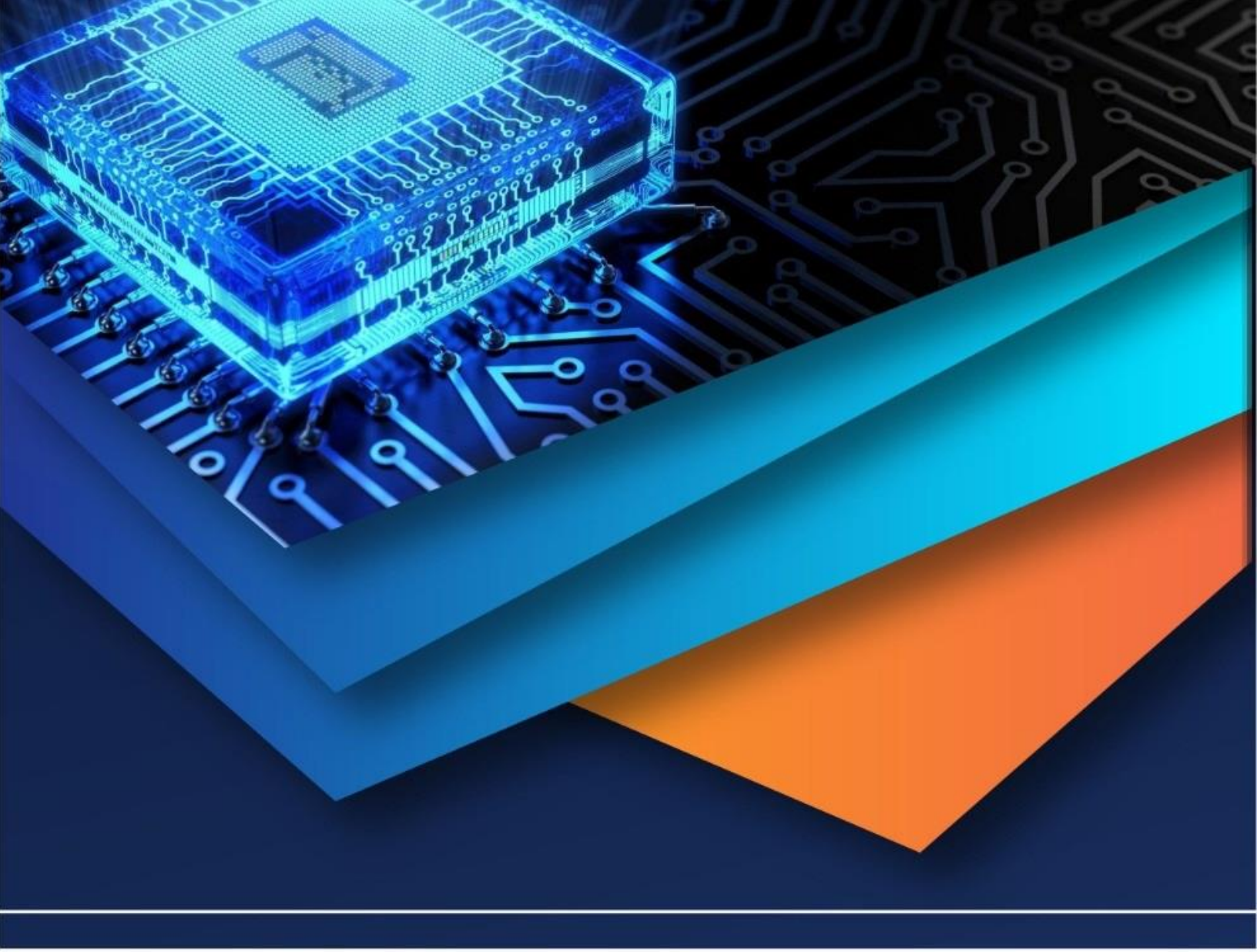

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