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Warehouse Management and Assistance using Internet of Things and RFID

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Abstract: ***Internet of things (IoT) is becoming a part of our life. It is also changing the environment around us. Also, in medical field it is replacing the conventional methodology of treating patients with a smart and intelligent one. Warehouse fires are one of problems that threaten sustainability of the warehouse. Early prevention system for indications of warehouse fires is absolutely necessary. The extent of the warehouse to be one of the problems encountered in the warehouse condition monitoring. To overcome the problems of warehouse, designed a system of warehouse fire prediction system by adopting the Wireless Sensor Network (WSN) using multiple sensor nodes with IoT module. In this proposed system, detection and Monitoring of warehouse fires through several sensors and send to IoT cloud Depending upon the sensor values in the cloud if it is greater than the threshold values it will send to the cloud server. Continuous monitoring and uploading values to cayenne cloud can be achieved. Each sensor node has a microcontroller, IoT module, and fire and smoke detection sensors. The RFID reader is used to allow the only authorized person with help RFID tag and RFID tag and LABVIEW software is used to monitor the stock list. A various gas sensor (smoke sensor, methane sensor, fire sensor are used to detect the harmful gas, the temperature sensor is LM 35 to monitor the temperature, the humidity sensor is used to check the humidity in the room.***
Keywords: Internet of things, RFID, Cloud, Warehouse, Sensors*.*

I. INTRODUCTION

Warehouses are utilized by makers, vendors, merchants, wholesalers, customs, and so on distribution center ought to be screened at standard stretches to lessen capacity cost of food grains because of climatic conditions and are recorded. With the extension of business and the consistent prerequisites of the food item variety, old style storage facility/item the board model won't meet that, because of its weighty limit and low capability. The issue looked by the Central Warehouse Corporation is capacity loss of food grains because of natural changes. We use various sensors to measure the fire/heat of the Warehouse environment and this system avoids granary/product wastage and also intimated to IOT for further actions. Using this we can monitor the available stocks in the warehouse through IOT Timely, relevant and accurate information regarding the internal status of the Warehouse helps in maintaining the quality of the goods as well as in storage loss reduction. The person enters IN/OUT time & all the sensors level monitored in the remote location using IOT module. Once the abnormal occurs, the MCU gets the alarm signal immediately to cloud. To reduce fire accident level in warehouse, we are using fire sensor, we fix them on the door and fire extinguisher. If there is any breaking of door occurs suddenly the intimation is given to the user mobile phone through vibration sensors. This project will help us to monitor in real time temperature, Humidity, smoke, Vibration and also allows the user to control the change. The fundamental Objective plan of distributed storage climate is utilized to store information and to handle the information. Internet of things permits actual gadgets or things which are not PC framework, that solitary demonstration intelligently and settles on coordinated efforts choice which are valuable for various applications. That application permits things to catch estimation of gadgets. They move "things from being latently registering" and settles on an independently choices in dynamic way and impart and team up to frame single troublesome choice.

II. EXISTING SYSTEM

In existing method of warehouse management is designed based on Internet of things technology. It can be used to record and query the basic information and location of items, with the problem of warehouse management solved. Assign a unique identification of bar code for each item, in which basic information of items is recorded. And the manager can read the basic information of items by using this management terminal to scan the barcodes on them. Record the storage location and responsible person of all items in the ware housing the RFID radio frequency card, and relevant information of the item can be queried through the card or the management terminal directly. Here in this method only the database of warehouse can be managed.

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Fig.1: Existing login interface of the warehouse

fig.2: item information modification interface of the Warehouse management system

III. COMPONENTS REQUIRED

A. Hardware Structure Design

This management terminal is mainly used for information collection and management of items, and requires small size, being convenient to carry and operate. In order to reduce the size of the hardware circuit board, modular design scheme is adopted. Cortex-A8 is used as the main control chip of the management terminal, and also includes peripheral devices such as display/touch screen module, RFID radio frequency module, and barcode scanning module. The system structure is shown in fig 3

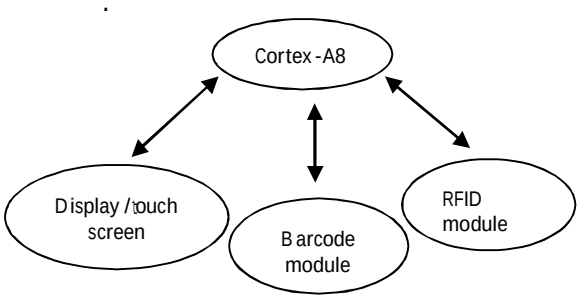

Fig 3: Hardware design

B. Barcode Scanning Module

Scan the barcode on the item, if its information is not entered, then collect and input it. If it has been entered, then functions such as querying, modifying and deleting the item information can be realized. The barcode scanning module is connected to the control core through a standard RS232 serial port, and the serial port baud rate is 9200. Each item has a uniquely labeled barcode. When the management system opens the barcode scanning module, it automatically opens the serial port and waits for data returned by the barcode module. At this time, the barcode scanning module can be turned on to scan the barcode on the article and transmit the scanned data to the control core, after obtaining the data, the control core will use this code to match the information in the database or perform other operations.

The barcode scanning module is connected to the control core through a standard RS232 serial port, and the serial port baud rate is 9200. Each item has a uniquely labeled barcode. When the management system opens

Fig 4: Barcode

The barcode scanning module, it automatically opens the serial port and waits for data returned by the barcode module. At this time, the barcode scanning module can be turned on to scan the barcode on the article and transmit the scanned data to the control core, after obtaining the data, the control core will use this code to match the information in the database or perform other operations.

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C. RFID Module

Realize the writing and card reading operation of the item information indexed by certain key information (such as item name, warehouse number or responsible person, etc.), and provides mobile convenience for the search, reconciliation and handover of items. The RFID module is used to establish an RFID card for each laboratory with the laboratory room number as the identifier, and the card records the index information of all the devices stored in the laboratory.

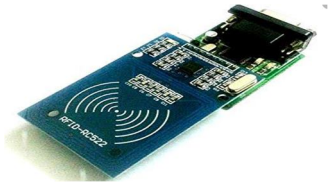

Fig 5: RFID Reader Module

IV. SOFTWARE DESIGN

The software structure of the handheld terminal adopts a client/server (C/S) structure. Considering the stability and portability of the handheld terminal system, the main body of the software system uses the open source embedded Linux operating system with kernel3.0. The Linux system has good stability and convenient portability. It also has perfect driver support for various peripherals, and can manage the system's barcodes, RFID and other peripheral modules well. The data layer is the SQLite database, and the user layer is the management system interface written using QT based on Linux. The software of the management terminal is designed by module, which mainly includes query module, add module, modification module and RFID module of the graphic operation interface. The system flow chart is shown in Figure 4.

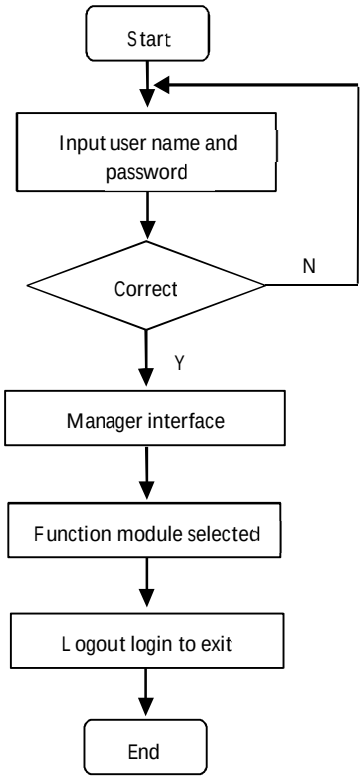

Fig 6: Flow chart of the system software

A. User Graphic Interface

The user graphical interface mainly includes such as login, logout login, password modification, query, addition and modification of item information, RFID and etc., as shown in Figure 6. Integrate the functions of each module of the warehouse management terminal, design the item information management software, and realize the management terminal of graphical operation.

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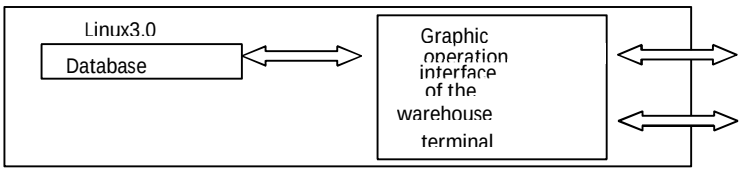

Fig 7: Overall framework of software design

V. PROPOSED SYSTEM

In addition to that allows only authorized person to enter into the warehouse. If the unauthorized person enters the warehouse then it will be intimated through IOT to the Authorized person. Each bundle of goods which enters the warehouse carries a RFID tag and RFID reader reads the tag and sends the data to the pic microcontroller. Using this we can monitor the available stocks in the warehouse through IOT. Gas sensor is used to detect. If any gas is formed inside the Warehouse. Temperature and flame sensor is used to detect any fire accidents happens inside the Warehouse, if fire is detected and then acoustic waves are generated to extinguish the fire. Humidity sensor is used to measure the moisture around the environment inside the warehouse and it is intimated through IOT. Movement of birds or other animals inside the warehouse is monitored, while the door was closed.If anyone breaks the door the information should be given through IOT module cayenne app to user mobile phone. Due to COVID situation PIC microcontroller programmed to spray hand sanitizer automatically after the door is open. Sensor based technology is also used for detecting the occurrence of smoke and fire in warehouse. IoT devices have different sensors that are deployed in the device itself to generate the alarming only if there is any deflection in the environment. Warehouse fire and gas is measured by using temperature sensor, flame sensor, CO sensor & gas sensor and then sensor values fed to the PIC (16F877a) microcontroller. The microcontroller sends the sensor values to the PC through USB to UART converter. The PC is used to stock list using LabVIEW. WSN doesn't need any human mediation for finding the smoke and fire in the woods. The WSN utilizes the web network for checking and recording the states of resembling temperature, smoke and dampness in the stockroom.

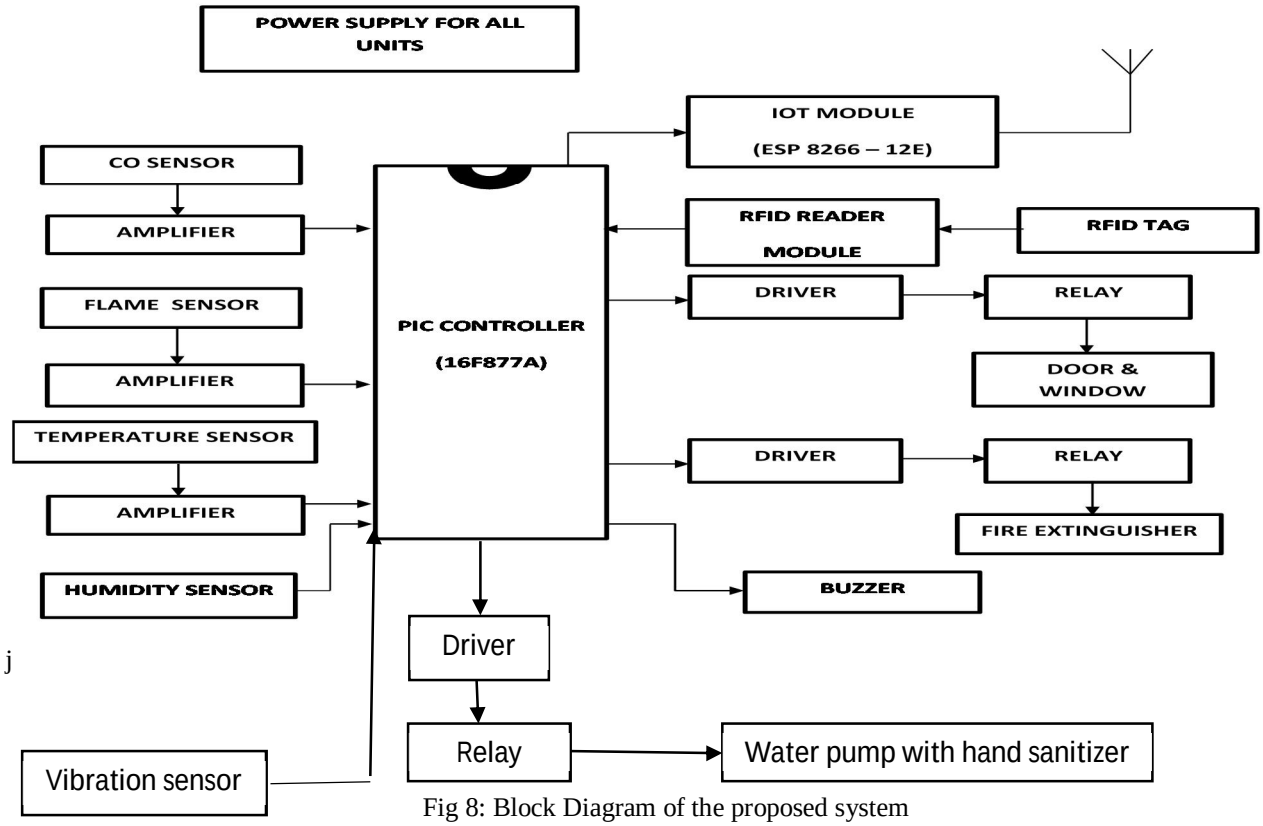

Fig 8: Block Diagram of the proposed system

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VI. METHODOLOGY

The system is connected with IOT cloud through Internet. At once, the system configures with cloud, the cloud server shows the data monitoring screen. The RFID employee tag is shown to the RFID reader door will be open and the employee card number will be display on the mobile app through cloud. The RFID stock tag is shown to the RFID readers, stock availability will display on LABVIEW software. Co sensor senses the smoke, flame sensor senses the flame, temperature sensor senses the temperature, Humidity sensor senses the moisture content and data is collected and given to the IOT module Vibration sensor senses the vibration occur in warehouse. Give the high temperature or flame or gas to the warehouse suddenly windows will open, fire extinguisher is on. Sensors value recorded in cayenne mobile app through cloud Fig 9 shows the simple real time experimental setup.

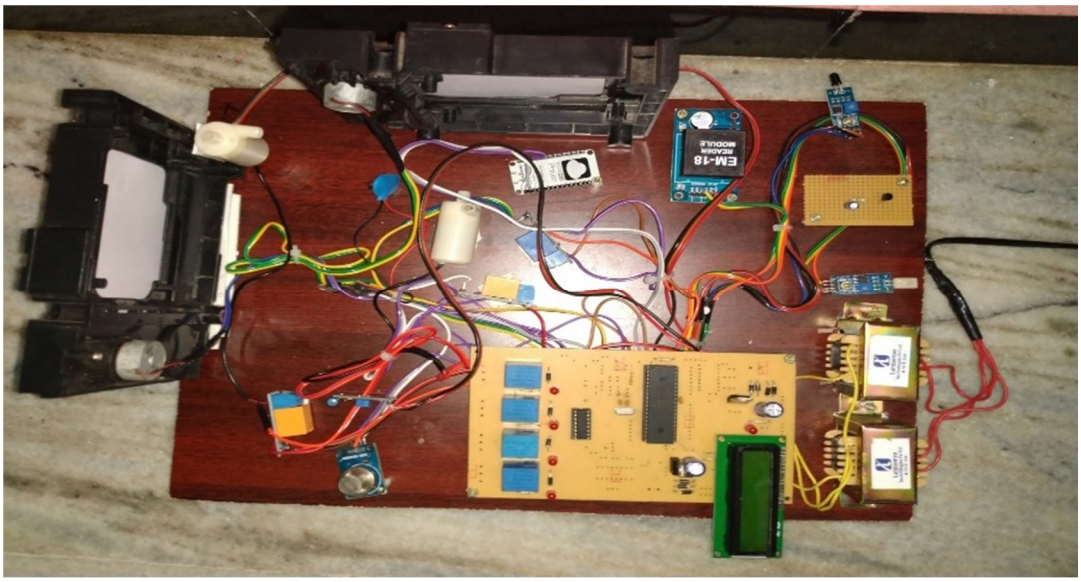

Fig 9: Experimental setup

VII. RESULTS & OUTCOME

After connecting the sensors with the PIC controller and sensors collects values of data from the warehouse and sends to cloud for remote access of data to the warehouse authorities. Our system providers have to handle thousands of environmentally sensitive items in the cold chain environment, Numerous associations are accordingly putting resources into IoT-empowered distribution centers for better robotized control frameworks (ACS) and stockroom the board frameworks (WMS) to improve their operational proficiency by decreasing expenses. The item quality is an essential concern for clients in choosing co-ordinations specialist organizations. To offer such types of assistance, load observing and successful capacity direction ought to be planned in order to keep a serious edge on the lookout. Our essential objective is consistently to build up a low force, solid, more exact observing of information at moderate cost. Fig 10 shows display of employee Id number after showing RFID tag. Fig 11 shows the recorded sensor values in app. Fig 12 shows the lab view stock availability screen.

Fig 10 LCD output display

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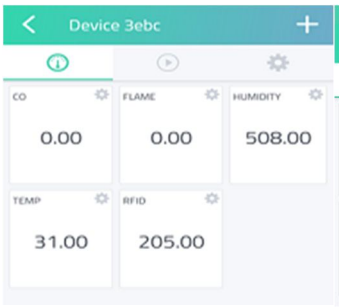

Fig 11: cayenne app output with RFID

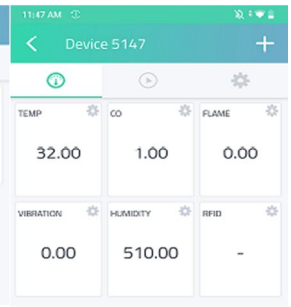

Fig 12: sensors recorded value in app

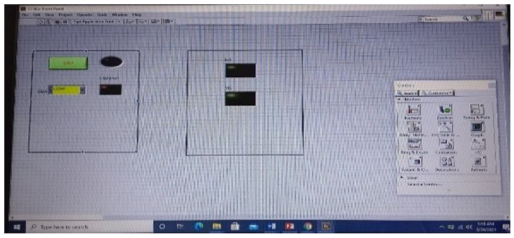

Fig 11: Lab view output of stock availability

VIII. CONCLUSION

We are entering the robotization age where machines match or out act in a scope of errands going from repetition to really innovative. Need for capacity emerges both for crude materials just as completed items. Stockroom robotization is an advanced change. Overall deals of stockroom mechanization innovation (advanced mechanics, co-ordinations, and so on) came to $1.9 billion of every 2016 and are relied upon to arrive at a market estimation of $22.4 billion before the finish of 2021. Pick-to-Light, RFID, and Pick-to-Voice advances diminish picking mistake rates by 67% contrasted with manual paper-and-pen techniques. This framework is useful to screen the different boundaries of stockroom and furthermore it will educate to the client by transferring the information on distributed computing worker utilizing IOT. Planning should be possible as indicated by the reasonableness of the proprietors. Likewise, the straightforwardness of this framework assists with lessening the weights of the people and cases. A mix of sensors, cameras, lasers, and programming can be utilized to empower forklifts to work close by individuals, yet without the requirement for human administrators.

IX. FUTURE WORK

This paper is very much useful for creating automatic warehouse using IOT and RFID. The warehouse of the future will take advantage of automated capacity management by leveraging technology for better, data-driven capacity planning.

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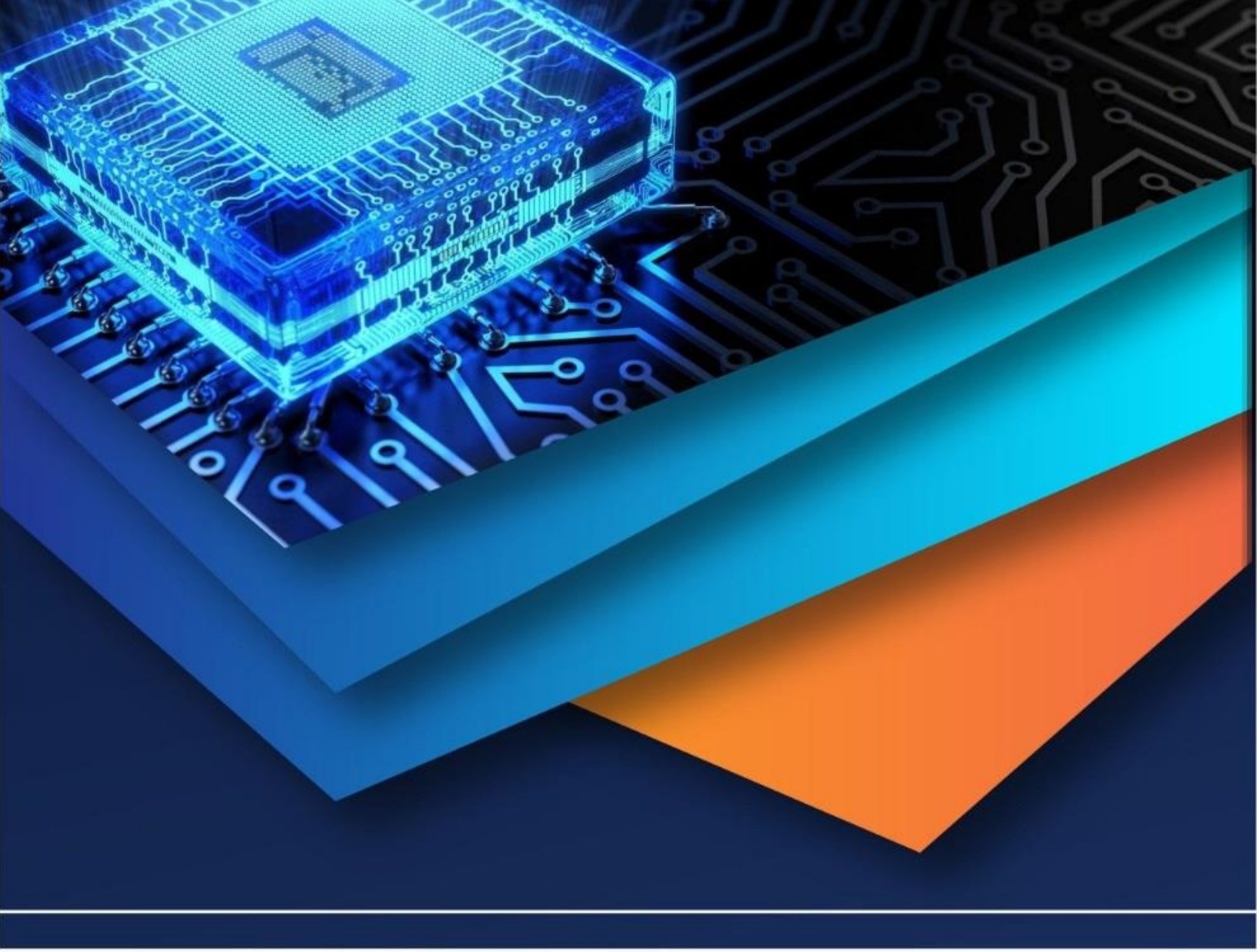

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