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Visual Surveillance Using Absolute Difference Motion Detection System

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Abstract*—Continuous Surveillance is closed observance or monitoring of unusual behaviour or any other activities. As security is becoming the major concern of society and hence having a security system is highly essential. Video surveillance plays a vital role in security systems. Visual surveillance describes the ability to recognize objects and humans, to describe their actions and interactions from information using image processing techniques, images acquired by Camera. Real-time implementation is achieved by using a Global System for Mobile Communication (GSM) modem for SMS (Short Message Service) notification. A buzzer indication is used to alert the neighbors around the building. Visual surveillance system can be implemented in various fields where security is highly mandatory.

Keywords*— continuous surveillance, GSM module, buzzer indication

I. INTRODUCTION

Security is the primary concern in all fields, especially in major areas like museum, jewellery shops and so on. Visual surveillance can be implemented in any major fields wherever security is the major factor. By using visual surveillance method the master image is stored in the HDD (Hard Disk Drive) on comparing the input images with the master image if there is any defect found when compared with the master image by using absolute difference method then the variation of the image would be detected and intimated to the affected environment by a high beep sound using buzzer and also the user would be intimated about the theft by sending SMS through GSM.

II. LITERATURE STUDY

A. Background Subtraction Method

Background subtraction methods are widely exploited for moving object detection in videos in many applications, such as traffic monitoring, human motion capture and video surveillance. How to correctly and efficiently model and update the background model and how to deal with shadows are two of the most distinguishing and challenging aspects of such approaches. This work proposes a general-purpose method which combines statistical assumptions with the object-level knowledge of moving objects, apparent objects (ghosts) and shadows acquired in the processing of the previous frames. Pixels belonging to moving objects, ghosts and shadows are processed differently in order to supply an object-based selective update. The proposed approach exploits gray color information for both background subtractions to improve object segmentation. The approach proves fast, flexible and precise in terms of pixel accuracy.

B. Temporal Difference Method

The Temporal differencing method uses the two or three adjacent frame based on time series image to subtract and gets difference images, its working is very similar to background subtraction after the subtraction of image it gives moving target information through the threshold value. This method is simple and easy to implement, and also it is similar to the background subtraction. But this method is highly adaptive to dynamic scene changes; however, it generally fails in detecting whole relevant pixels of some types of moving objects. Additional methods need to be adopted in order to detect stopped objects for the success of higher level are computationally complex and cannot be used real-time without specialized hardware.

C. Optical Flow Analysis

The optical flow method uses the motion target of the vector characteristics which changed with time to detect motion area in image sequences. It gives better performance under the moving camera, but this algorithm is very complex and complicated computation and also it needs special hardware support, so it is difficult to meet the requirements of real-time video processing.

D. Improved Temporal Difference Method

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Improved temporal difference method will detect the hole precisely and would remove the holes that could occur in the images accurately. But this process is carried out pixel by pixel basis, this would be time consuming which may process for a very long time.

III.PROPOSED METHOD

A. Security Alert System

Security is a key factor in this project; hence GSM is used to send an immediate alert message to the user via mobile phone. Message can be sent to more than one authenticated mobile number.

To alert the surrounding environment in order to safeguard the ruined neighborhood, we use a buzzer to alert the surroundings using a high beep sound.

B. Objective of Project

The main objective of the work is to come up with cost effective, reliable, scalable and a real time security alert system using visual surveillance through continuous monitoring.

The proposed system is designed as a visual surveillance system. This system uses an absolute differencing technique to detect the motion of an object in the motion restricted area.

Captured image is stored as a master image. This image then converted into gray image to perform absolute differencing method with live captured image so as to detect the motion in the surveillance area. Once the motion is detected, BLOB can be detected which is causing motion and an alert is generated. With the generation of an alert, the captured motion is being saved into HDD so as to observe the object responsible for motion. Lastly, if user enables SMS notification option he will get a notification that a motion has been detected. And the locality is alerted using a high beep sound indication through buzzer.

C. Block Diagram of Visual Surveillance

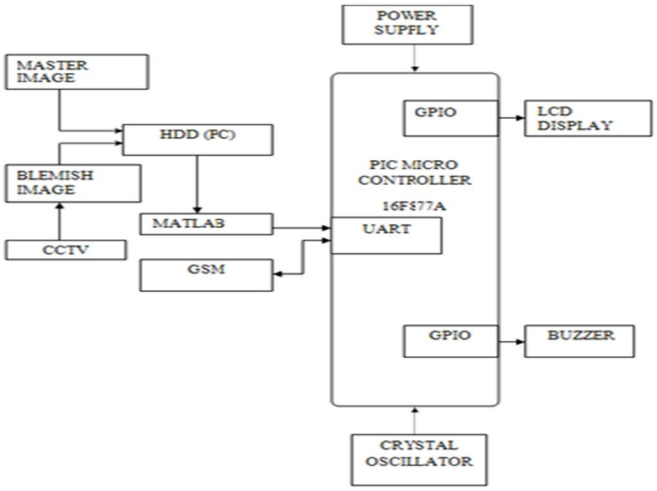

Fig.1. Block Diagram of Visual Surveillance

D. Power Supply Design

This circuit consists of a small +5V power supply, which is useful when experimenting with digital electronics. Small inexpensive wall transformers are easily available, but usually their voltage regulation is very poor, which makes them not very usable for digital circuit experimenter unless a better regulation can be achieved in some way. The following circuit is the answer to the problem. This circuit can give +5V output at about 150 mA current, but it can be increased to 1 A when good cooling is added to 7805 regulator chip. The circuit has over overload and terminal protection. The capacitors must have enough high voltage rating to safely handle the input voltage feed to circuit.

E. PIC Micro Controller

1) High-performance RISC CPU
2) Only 35 single word instructions
3) All single cycle instructions except for program branches which are two cycle

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4) Operating speed: DC - 20 MHz clock input DC - 200 ns instruction cycle
5) Up to 8K x 14 words of FLASH Program Memory,
6) Up to 368 x 8 bytes of Data Memory (RAM)
7) Up to 256 x 8 bytes of EEPROM data memory
8) Interrupt capability (up to 14 sources)
9) Eight level deep hardware stack
10) Direct, indirect and relative addressing modes
11) Power-on Reset (POR)
12) Power-up Timer (PWRT) and Oscillator Start-up Timer (OST)
13) Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation
14) Programmable code-protection
15) Power saving SLEEP mode
16) Selectable oscillator options
17) Pic is used to interface the UART and GSM module

F. SMS Service

SMS (Short Messaging Service) service is a text messaging which allow you to send and receive text messages on your GSM Mobile phone. These services are being used in collaboration of Television Networks or Radio Networks to demand SMS from the audiences.

Most of time charges are paid by the SMS sender but for some services like stocks and share prices, mobile banking facilities and leisure booking services etc. recipient of the SMS has to pay for the service.sms service is carried out through GSM module to the master.

G. Interfacing LCD with PIC

STEP 1: Identify

Determine what you want LCD are available in many flavours which are specified as follows 16x1 , 16x2 , 20x2 in the format AxB where A is the number of columns (chatters) and B is the number of Rows (lines) An LCD might also be Back lit.

STEP 2: Connect

Most of the LCD's follow the standard Hitachi Pin out which is as follows:

TABLE I: LCD INTERFACING

Pin No	Name	Function	USE
1	Vss	Ground	Simple ground connection
2	Vdd	+ve Supply	5v Volts Regulated DC
3	Vee	Contrast	This is used to set the contrast1
4	RS	Register Set	Register select signal “0”:Instruction register (when writing) Busy flag & address counter (When reading) “1”:Data register (when writing & reading)
5	R/W	Read / Write	Read/write select signal “0” for writing , “1” for reading
6	E	Enable	Operation (data read/write) enable signal
15	A	+4.2 for Backlight	Positive supply for back light if available
16	K	Power supply Back light (0V)	Ground connection

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STEP 3: Interface

Now connect pins RS ,RW ,E ,D0 - D7 to pins on the micro controller Lets suppose I connect Data bus on port A and the RS , RW , E on port B . (you can save pins by using LCD in Nibble Mode (4 data pins) and permanently grounding the RW line (always in write mode) . Now we will see how to go from simple switching it on to graphics on the LCD.

An Intelligent LCD Need only a few Commands and data to function Command Set for the LCD.

H. UART Port

UART male and female port connectors. The PC connector is called as male connector and the micro controller connector is called as the female connector are use to interface with the pc with controller.

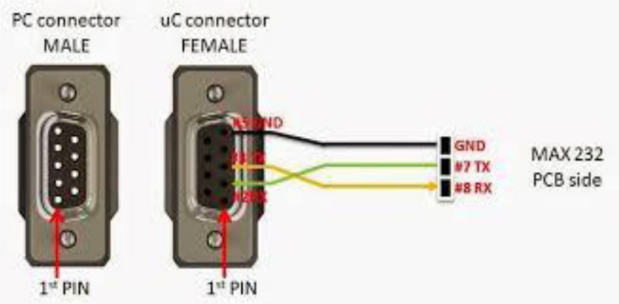

Fig.2 UART Connector

I. Buzzer

A buzzer or beeper is a signalling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows.

Fig 3. Buzzer

TABLE III BUFFER SPECIFICATION

Operating frequency	3.1 ± 0.5 KHz
Operating voltage	3 ~ 20 V dc
Current consumption	14 mA
Sound pressure level	73 db
Rated voltage	12 V dc
Tone	Continuous
Operating temperature	-30 ~ +85° C
Storage temperature	-40 ~ +95° C

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IV. RESULTS AND DISCUSSION

A. *Simulation Tool*

1) *MAT LAB Software:* MATLAB® is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.
2) *MPLAB Ide Software:* MPLAB is a free integrated development environment for the development of embedded applications on PIC and ds PIC microcontrollers and is developed by Microchip Technology
3) *PROTEUS:* PROTEUS is an execution-driven simulator. Like Tango and RPPT, it directly executes most instructions to achieve very high performance.

B. *Verification Of Processed Image*

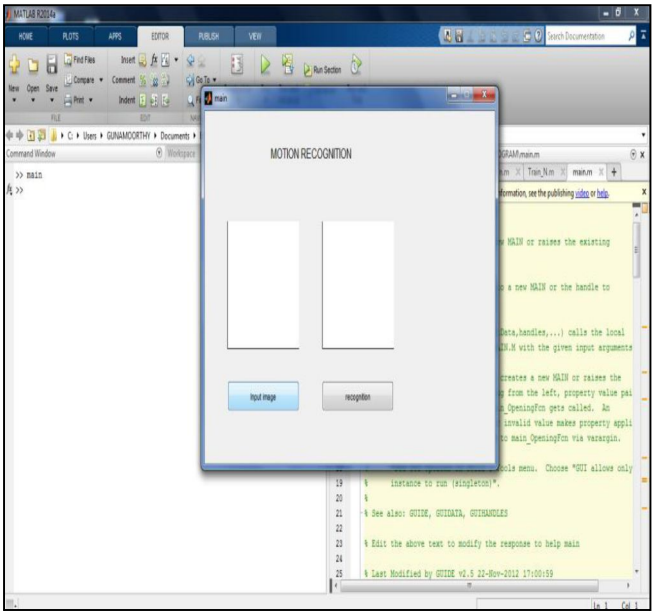

Fig4. Verification of Processed Image

C. *Image Comparison*

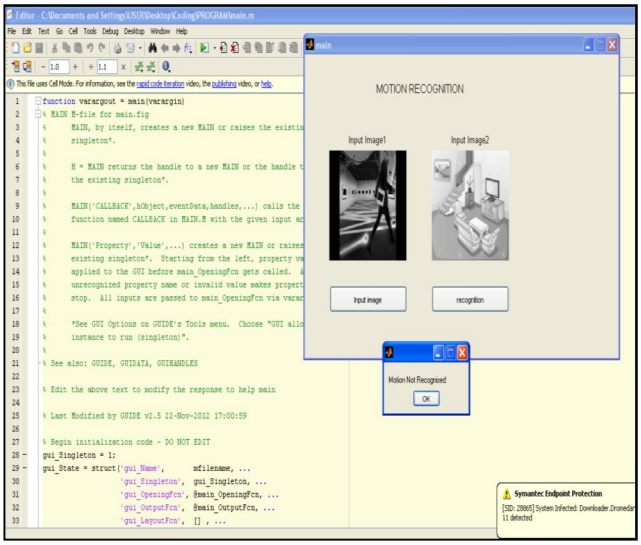

Fig5. Image comparison

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D. Detected Image

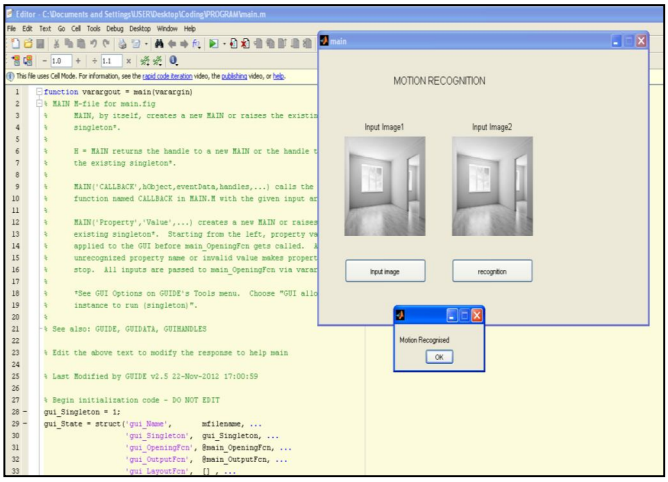

Fig6. Comparison of Input Image with Master Image

E. Simulated Proteus Output

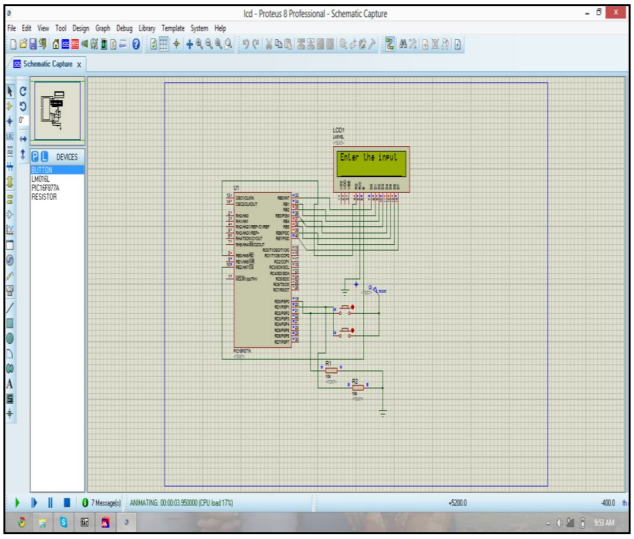

Fig7. LCD interface with PIC

F. Hardware Tools

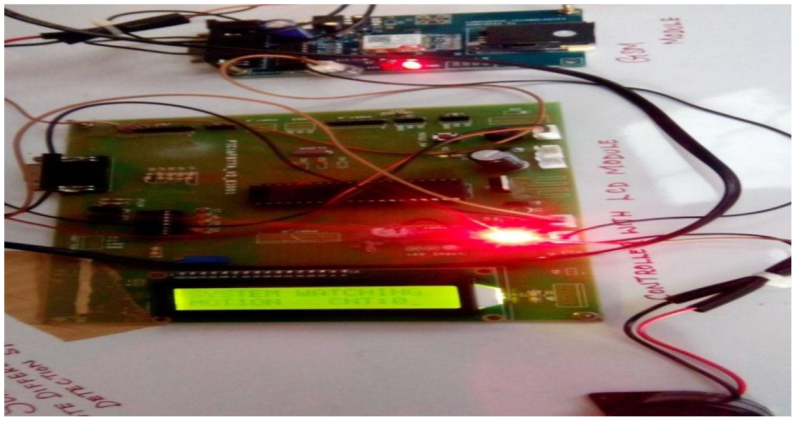

Fig8. Surveillance of the System

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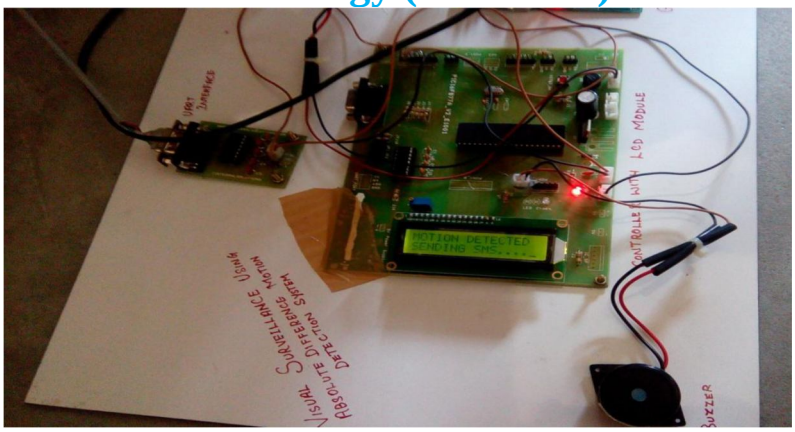

Fig9.Sending SMS to User

V. CONCLUSION

Continuous visual surveillance system is to find out the motion made by any object in the surveillance area and generate the alert and allow user to get SMS notification and also to alert the surrounding with a high beep sound, once the motion is taking place in that area. We can conclude that the surveillance plays a major role in real time so as to monitor the motion of any unnecessary obstacles in the motion restricted area and immediately the user is getting the SMS containing text as “Motion Detected”. And also buzzer is used to indicate the locality about the theft happened in the surveillance area. Also the captured images are getting stored in the hard disk drive for further reference.

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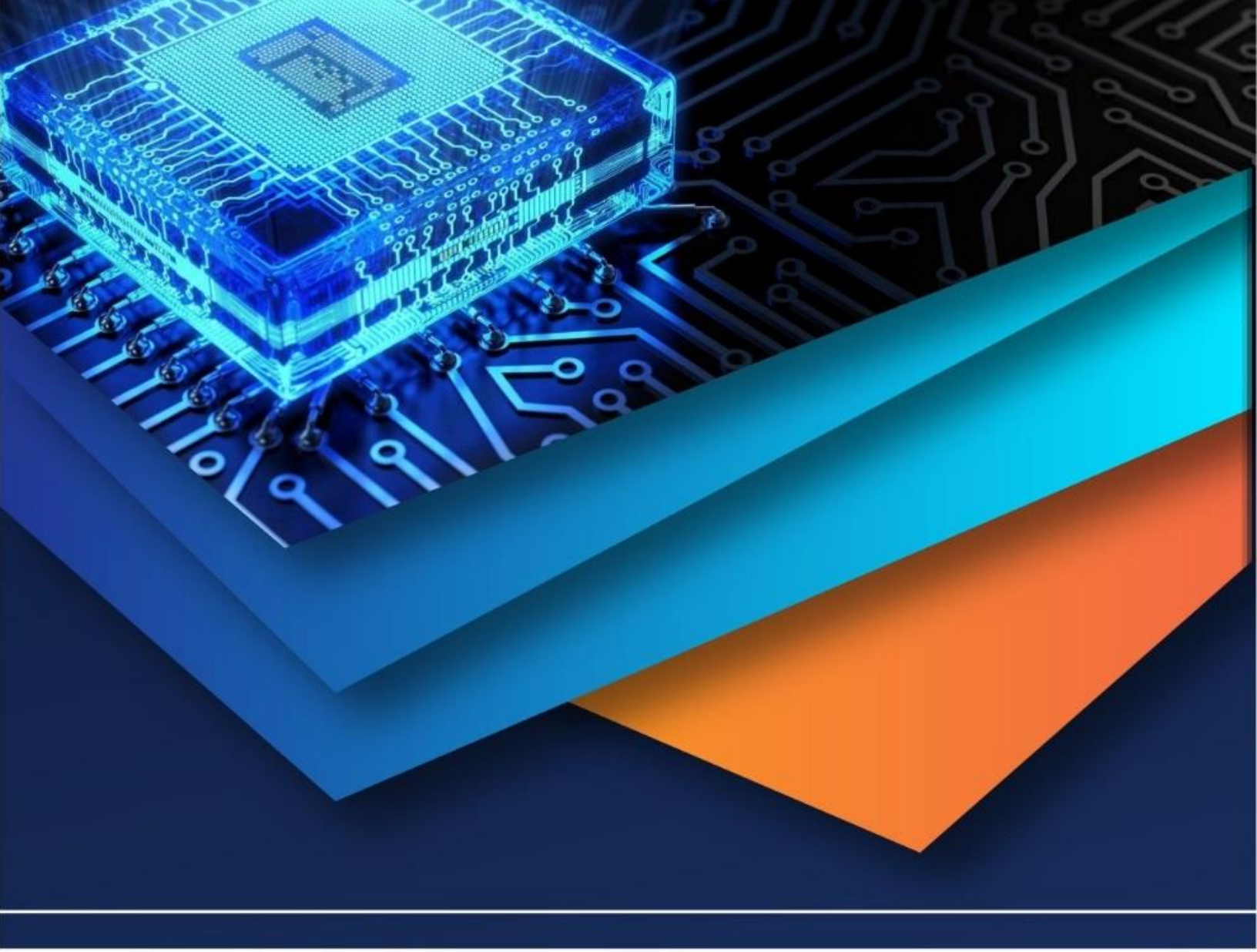

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