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IOT Based Smart Black Box System for Cars

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Abstract: ***Automotive electronics plays a vital role in the automotive industry, offering affluence features and resolving protection and security issues more specifically.***
The work presented in this paper aims to have a cost-effective solution for the planning and production of an event data recorder that has been embraced essentially by the aviation industry, taking into account both the need and the associated benefits. The paper presents an integrated black box design with critical data recorder features and an investigation tool will work to avoid potential accidents by evaluating the previous accidents.
The black box includes an automated warning system for incidents that helps to alert the closest hospital as well as the traffic authority and urgent medical treatment within a few days. Therefore the total cost of incorporating these various features is highly optimized.
Keywords: Black Box in car, IOT, automobiles.

I. INTRODUCTION

The work presented during this paper aims to have an appropriate solution for the appearance and production of an incident data recorder that has been implemented in the aircraft sector, taking into account both the requirement and the associated advantages. The paper introduces a recorder design with the critical features of the information recorder that can be very useful for domestic vehicles and at the same time it also hosts many other features that can help reduce the amount of accidents, or at bare minimum, an analytical tool would work to avoid potential accidents by evaluating the previous accidents.
The data recorder also provides automatic notification of accidents which helps to alert the hospital and the traffic authority by not only providing the accident coordinates but also the precise physical address for immediate medical attention which may save numerous lives daily. The recorder also hosts many other sophisticated web monitoring features anytime and from anywhere.
In this system we use ARDUINO MEGA (ATmega2560) microcontroller, which serves as the system's brain because all the instructions of the computer program are stored in it. Here we've used ultrasonic sensor, gas sensor and temperature sensor to know the status of vehicle and driver like level of fuel, detection of alcohol and temperature inside the vehicle respectively. The crash sensor which we use here to start will data read from the vehicle using sensors mentioned above and store to SD card and IOT module.
We use the GSM module here to notify the respective individual and public service agency, and also the family member. Both the data is transferred to the cloud such that IOT controls or tracks the operation of the system.

II. EXISTING AND PROPOSED SYSTEM

A. Existing System

In Existing System contains Camera for recording during the accident so there is a difficultly to identify the accident occurred to the vehicle when the camera gets damaged. It does not provide any sufficient information. It does not provide any sensor to know about the vehicle Information.

B. Proposed System

In the advanced system each vehicle are monitored continuously. The data are uploaded when accident occurs so that the time consumed is less. Collision data is used for analysis to enhance the internal and external design of the vehicles. The collected can be used be used for future analysis.

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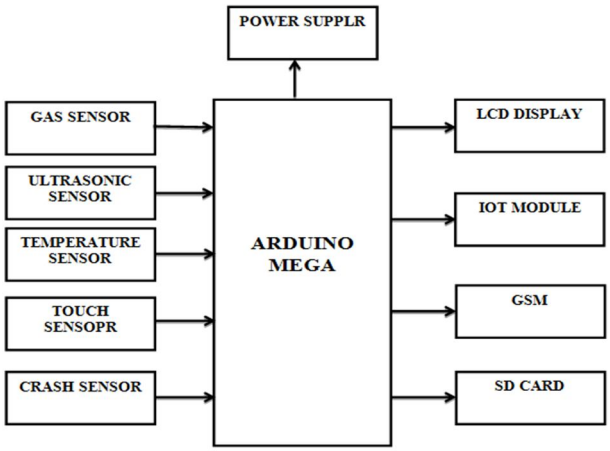
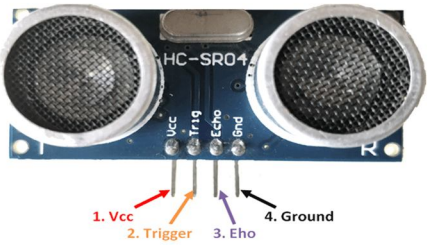
III. SYSTEM ARCHITECTURE



IV. COMPONENTS DESCRIPTION

*A. Ultrasonic Sensor (HC-**SR04**)*

An ultrasonic sensor is an instrument which uses ultrasonic sound waves to measure the space of an object. Using an ultrasonic sensor a transducer sends and receives ultrasonic pulses that transmit back information about an object's proximity.High frequency sound waves resonate from borders and have distinct patterns of echo.

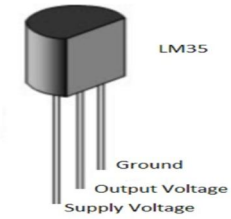


B. GAS Sensor (MQ-2)

MQ-2 gas sensor perceptive material is SnO2, which is conductive in clean air with lower conductivity. If there is the target combustible gas, the conductivity of the sensor should be higher than the increasing gas concentration. It'll constantly sense the gases which will be within the car.

C. Temperature Sensor (LM35)

Temperature sensor essentially measures the heat / cold generated by an object it is attached to. It constantly measures the Engine heat and passes the worth when the crash Sensor gets detected.



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D. Crash Sensor (SKU: SEN0138)

Crash sensors were able to detect a collision within milliseconds and translate it to functional signals. The accelerating forces working on the sensors after a collision are often as high as 100g. When a car is stopped abruptly by an impression, all bodies or objects that aren't firmly fixed to the car will still move at the impact speed. The sensors measure this dispatch and relay it to the control unit as usable data.

E. Liquid Crystal Display

LCD screen is a module for electronic display and has a wide variety of applications. A 16x2 LCD display is an extremely simple module and is used in different devices and circuits extremely commonly. In every 1.5 seconds, LCD will continuously show all the details the sensors feel.

F. GSM Network

GSM (Global Mobile Communication System) can be a wireless telephone network that is commonly used to connect with other networks through smart phone users. During this project when the crash sensor gets detected it intimates the GSM to send the info the emergency contact like hospital and traffic police agents.

G. IOT Module

The Internet of Things (IoT) is revolutionizing and changing our way of working and living, but only with invisible, scalable, and long-lived wireless connectivity can it. This IOT module will work when the crash sensor gets detected, all the info from the sensor will get stored within the webpage which can act as an external storage.

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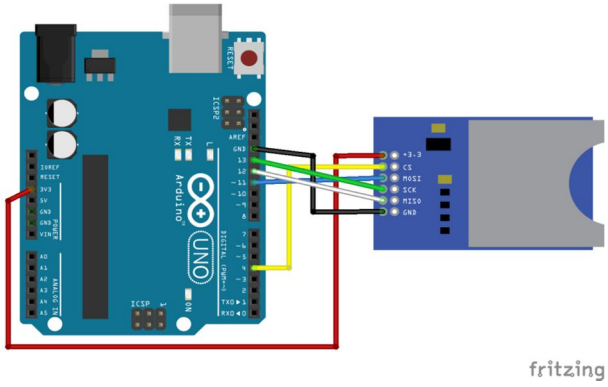
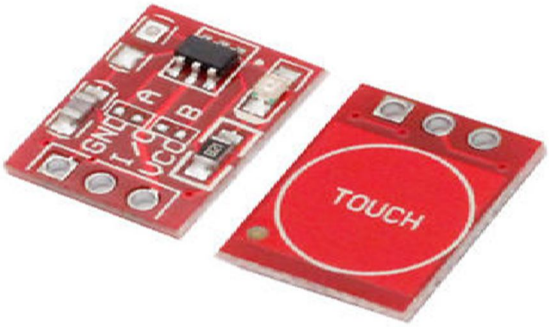
H. SD Card

SD Card (Secure Digital Card) is an ultra-sized non-volatile storage card designed to provide high-capacity memory over a short size span. Most small transferable devices, such as digital video camcorders, compact cameras, portable computers, audio players, and cell phones use SD cards. SD Card will stores data when the accident gets detected the data's that's being stored within the webpage same set of knowledge are going to be stored within the SD card.



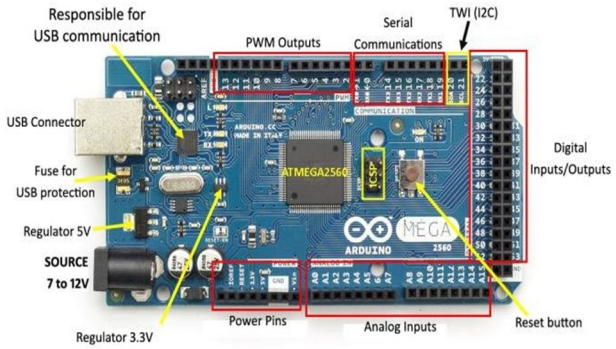
I. Touch Sensor

Touch Sensors are the sensors that can sense contact. When touched they act as a switch. Such sensors are used in lamps, handheld touch screens etc... Touch sensors have an intuitive interface. Contact sensors are also called tactile sensors. They are easy to design, low cost, and large-scale produce. Those sensors are replacing the mechanical switches with the advance in technology. There are two kinds of touch sensors assisted by their features-Capacitive sensor and Resistive sensor.

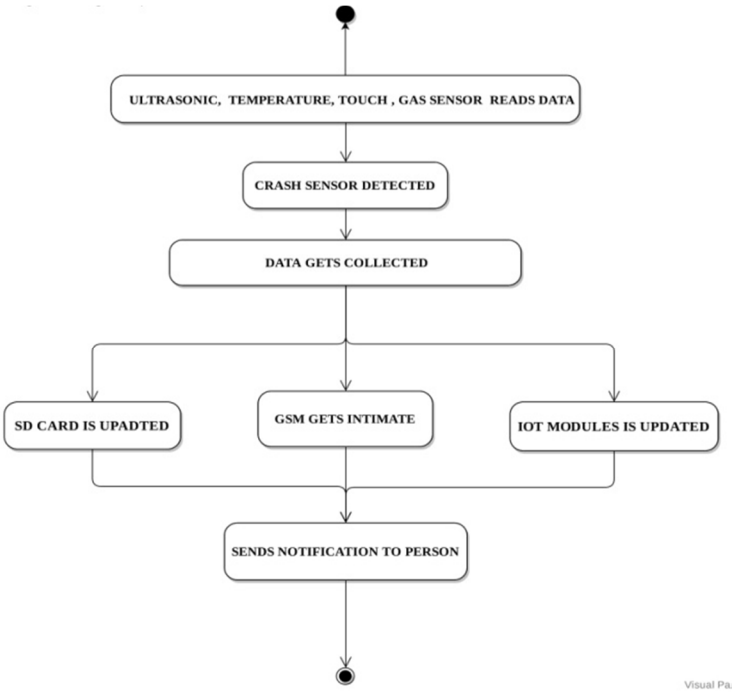


J. Arduino MEGA2560

The Arduino Mega 2560 is supported on the ATmega2560 microcontroller board. It has 54 digital input / output pins (of which 15 are commonly PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), 16 MHz crystal oscillation, a USB link, a power jack, ICSP header, and readjust key. It contains all the microcontroller requires to help. All the sensor will be interfaced with the microcontroller. All the programs will be stored in the microcontroller.

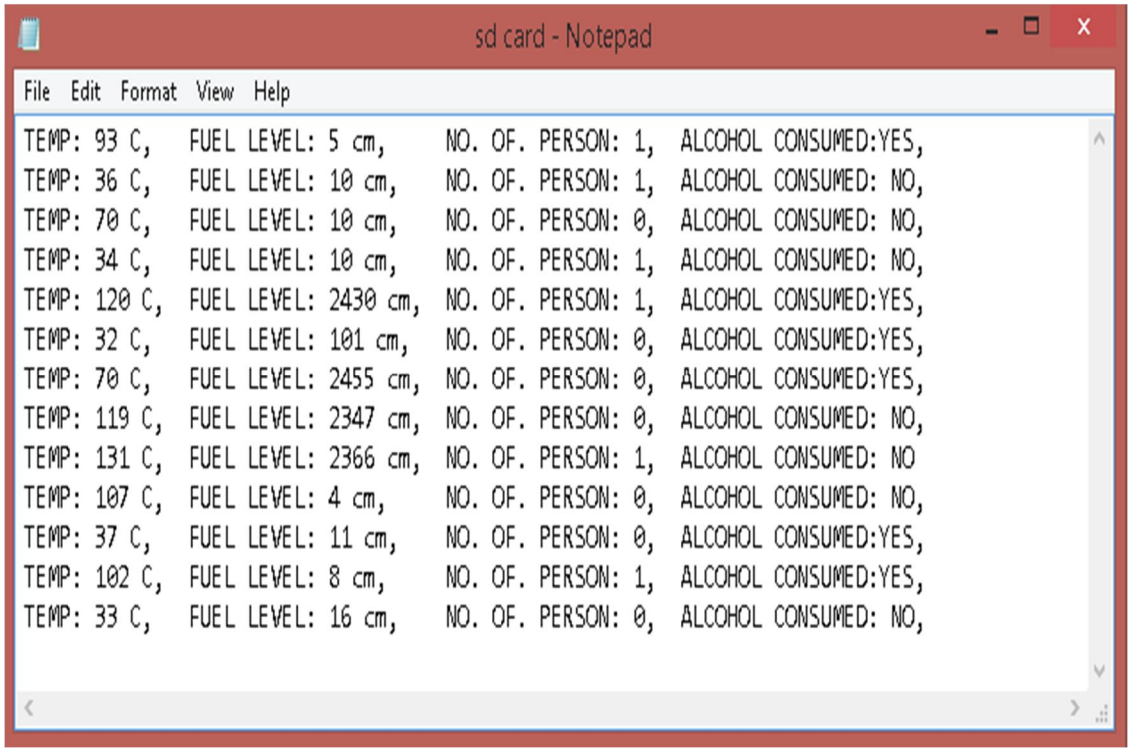


V. IMPLEMENTATION

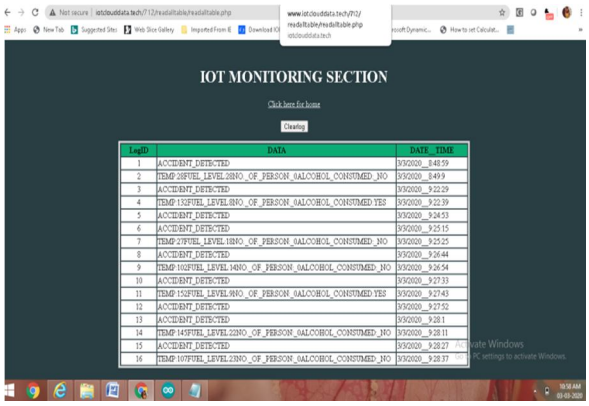


VI. EXPERIMENTAL RESULTS

The paper includes implementation of both the program and the hardware. In this paper the findings for both are clarified. The project has the objective to design and build of "IOT BASED SMART BLACK BOXSYSTEM", details are shown accordingly. Switching the load on all the sensor gets constantly sensed and the LCD display the data every 1.5seconds. Once the crash detection happens, the data from all the detection is contained in the SD card is detected.

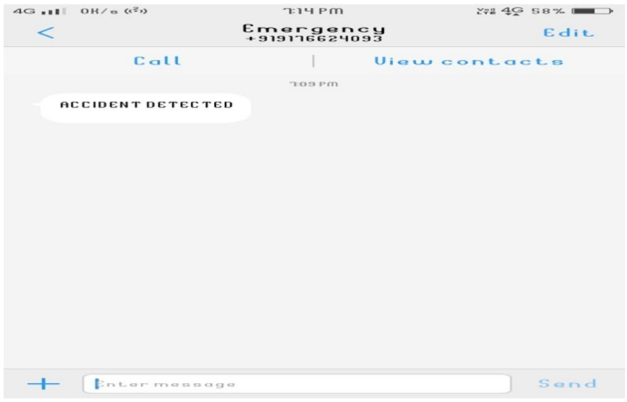


The same data also gets stored in IOT Module.

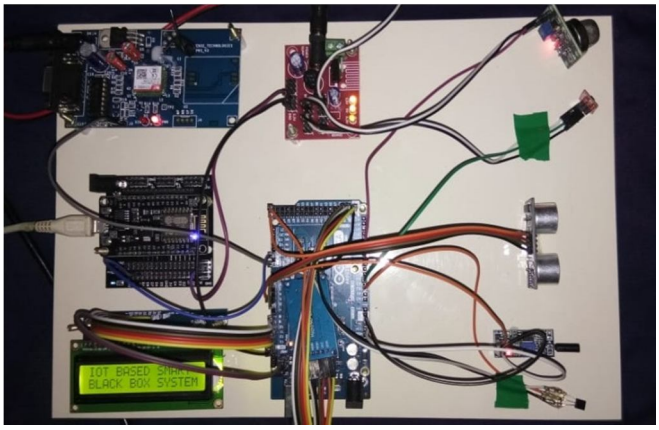


LogID	DATA	DATE_TIME
1	ACCIDENT_DETECTED	3/3/2020_8:48:59
2	TEMP:26FUEL_LEVEL:28NO_OF_PERSON_0ALCOHOL_CONSUMED_NO	3/3/2020_8:49:9
3	ACCIDENT_DETECTED	3/3/2020_9:22:29
4	TEMP:13FUEL_LEVEL:8NO_OF_PERSON_0ALCOHOL_CONSUMED:YES	3/3/2020_9:22:39
5	ACCIDENT_DETECTED	3/3/2020_9:24:53
6	ACCIDENT_DETECTED	3/3/2020_9:25:15
7	TEMP:27FUEL_LEVEL:18NO_OF_PERSON_0ALCOHOL_CONSUMED_NO	3/3/2020_9:25:25
8	ACCIDENT_DETECTED	3/3/2020_9:26:44
9	TEMP:102FUEL_LEVEL:14NO_OF_PERSON_0ALCOHOL_CONSUMED_NO	3/3/2020_9:26:54
10	ACCIDENT_DETECTED	3/3/2020_9:27:33
11	TEMP:15FUEL_LEVEL:6NO_OF_PERSON_0ALCOHOL_CONSUMED:YES	3/3/2020_9:27:43
12	ACCIDENT_DETECTED	3/3/2020_9:27:52
13	ACCIDENT_DETECTED	3/3/2020_9:28:1
14	TEMP:145FUEL_LEVEL:22NO_OF_PERSON_0ALCOHOL_CONSUMED_NO	3/3/2020_9:28:11
15	ACCIDENT_DETECTED	3/3/2020_9:28:27
16	TEMP:107FUEL_LEVEL:23NO_OF_PERSON_0ALCOHOL_CONSUMED_NO	3/3/2020_9:28:37

The GSM gets intimated as soon as the accident happens and sends the notification to the emergency contact.



The complete IOT Based Smart Black Box System is shown below.



VII. CONCLUSION

Thus the built Black Box Design is always incorporated in any car. As soon as it is implemented it keeps monitoring the info and once the vehicle gets crashed the info get stored in SD card and in IOT module. The IOT module out here acts as an secondary storage because SD card cannot be retrieved whenever when the accident happens. The device also gives approved mobile warning massage whenever the accident happens so that the approved person also knows about the protection of their traveler which can help many lives every day. The GSM module mounted inside a car also sends this to the emergency numbers. Recorded data used for police inquiry and insurance purpose.

A. Future Enhancement

We will enhance this system by adding other different parameters like fuel level, tyre pressure. Many other parameters may also be stored within the memory Use GPS module during this program would be helpful in identifying the location of the accident and taking the rapid rescue operations. Another useful add-on to this device might be front-and rear-side cameras that keep capturing live images and saving them in memory. This video evidence can be very useful for investigating incidents. The reported information will act as an investigative method to avoid potential accidents by evaluating previous accidents.

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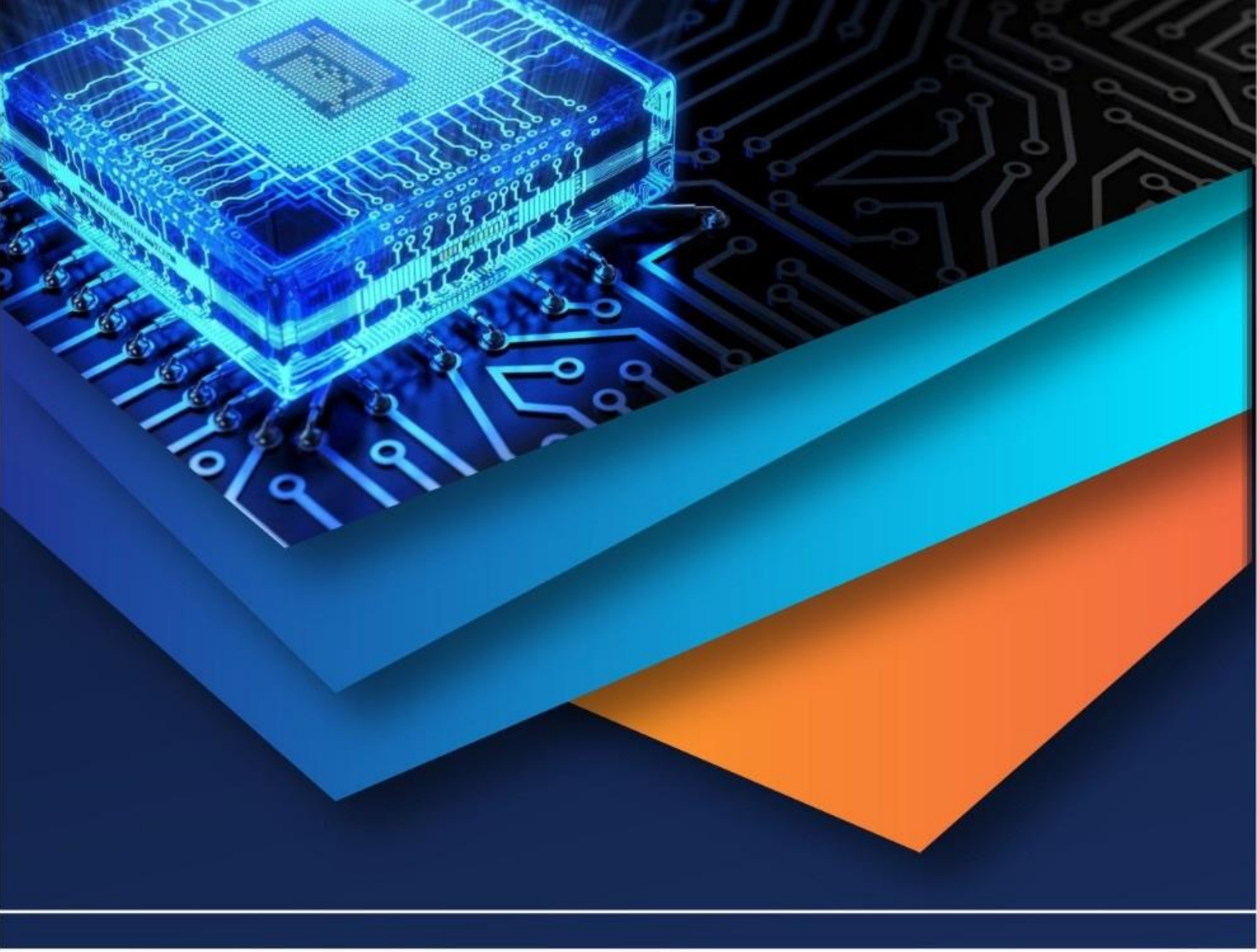

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