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Anti-Collision System in Train

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Abstract: Indian Railways is one of the world's largest railway networks in the world, transporting over 18 million passengers and more than 2 million tonnes of freight daily. Hence, the security of Indian railways becomes indispensible. The illegal removal of fish plates and collision on the same track leads to crash. The objective of our paper is to develop a radical system for continuous monitor of occurring of crack in track using power relays and immediate signalling. In our proposed system we record the trains on the same track using the Bluetooth device. Bluetooth device is interfaced with an ARDUINO board reads the location of the train's position so that the trains can be halted by applying emergency brakes and sending signals to both the train brake and train control rooms. Should such a case occur the train starts applying the brakes at a distance of 1 Km from the incident location? It is expected that if this system is implemented widely, train collisions and accidents can be avoided and amount of losses could be negated.
Keywords: Power relays, Bluetooth device, ARDUINO Board.

I. INTRODUCTION

Transport is very important to carry the passengers and goods from one place to another. Better transport leads to increased rate of trade. Economic level is highly dependent on increasing the capacity and quality of transport. In recent years, many passenger and goods train have derailed or suffered from collisions due to damages in rails .The damages to tracks are predominantly due to missing fish plate's accounts for the maximum number of such cases. People illegally remove fish plates for monetary benefits. Various terrorist outfits have also been involved in such detrimental activities. In other cases trains collide each other and leading to huge loss of life and trade goods.

A. Head-On & Rear-End Collisions

A head-on collision is one where the front ends of two vehicles hit each other, as opposed to aside-collision or rear-end collision. With rail, a head-on collision often implies a collision on a single line railway. In this paper we concentrate on detection of crack in track and collision of trains on same track using Ultrasonic sensors, ARDUINO board and tracing location using Bluetooth device.

II. EXISTING SYSTEM

The existing system uses sensors and GSM technology that provide security and collision avoidance. This system has been designed and simulated using protest real time simulation software. Various models for the railway traffic systems has also been generated and tested. Various sub modules communicate with each other and with a central monitoring station where entire data is stored and monitored.

III. PROPOSED SYSTEM

The proposed train anti- collision system consists of detection of cracks occurring in the tracks using power relays signal produced by power relays is sensed by the Arduino board and halts the train automatically as per the program that has been pre-programmed on said board. Bluetooth device is also proposed in this system in order to locate the trains which is interfaced with the Arduino board in order to trace the train.

A. Power Relay

A power relay is a switch which is used to open or close a circuit using electromagnetic coils. Power relays also contain an armature, a spring and one or several contacts. If the power relay is normally designed to be open, when power is supplied, the electromagnet attracts the armature, which is then pulled in the coil's direction until it reaches a contact, therefore closing the circuit. If the relay is normally designed to be closed, the electromagnetic coil pulls the armature away from the contact, therefore opening the circuit. Power relays are used for many different applications, including:

1) Automotive electronics
2) Audio amplification
3) Telephone systems
4) Home appliances

B. Requirements

1) *Arduino board:* Arduino ias hardware or software microcomputer project, and user community that are used to design and manufacture microcontroller kits for developing digital devices and interactive objects that can sense and control objects in the real world. The project's products are distributed as open source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), allowing the producer of Arduino boards and software distribution by anyone. These systems provide sets of digital and analogy input/output (I/O) pins that may be interfaced to various expansion boards or shields and other circuits. The board's features serial communications interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. The microcontrollers are mainly programmed using a dialect (local parlance) of features from the programming languages of C and C++. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project. Christo Ananth et al. [4] discussed about an eye blinking sensor. Nowadays heart attack patients are increasing day by day."Though it is tough to save the heart attack patients, we can increase the statistics of saving the life of patients & the life of others whom they are responsible for. The main design of this project is to track the heart attack of patients who are suffering from any attacks during driving and send them a medical need & thereby to stop the vehicle to ensure that the persons along them are safe from accident. Here, an eye blinking sensor is used to sense the blinking of the eye. SpO2 sensor checks the pulse rate of the patient. Both are connected to micro controller. If eye blinking gets stopped then the signal is sent to the controller to make an alarm through the buffer. If spO2 sensor senses a variation in pulse or low oxygen content in blood, it may results in heart failure and therefore the controller stops the motor of the vehicle. Then Tarang F4 transmitter is used to send the vehicle number & the mobile number of the patient to a nearest medical station within 25 km for medical aid. The pulse rate monitored via LCD .The Tarang F4 receiver receives the signal and passes through controller and the number gets displayed in the LCD screen and an alarm is produced through a buzzer as soon the signal is received.

There is an onboard micro-SD card slot, which can be used to store files for serving over the network. The on board micro-SD card slot is compatible with all the Arduino/Genuine boards. The on-board micro SD card reader is accessible through the SD Library. The working with this library, SS is on Pin 4. The original revision of the shield contained a full-sized SD card slot; this card slot is not supported. The shield also includes a reset controller. This is to ensure that the W5100 Ethernet module is properly reset on power-up. Previous revisions of the shield were not compatible with the Mega and hence need to be manually reset after power-up. Christo Ananth et al. [5] discussed about a system, GSM based AMR has low infrastructure cost and it reduces man power. The system is fully automatic, hence the probability of error is reduced. The data is highly secured and it not only solve the problem of traditional meter reading system but also provides additional features such as power disconnection, reconnection and the concept of power management. The database stores the current month and also all the previous month data for the future use. Hence the system saves a lot amount of time and energy. Due to the power fluctuations, there might be a damage in the home appliances. Hence to avoid such damages and to protect the appliances, the voltage controlling method can be implemented.

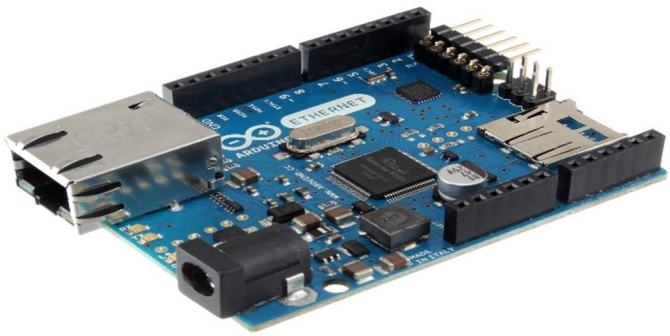

Fig: Arduino board

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C. Bluetooth Device

Bluetooth is a standard wire-replacement communications protocol primarily designed for low-power consumption, with a short range based on low-cost transceiver microchips in each device. Because the devices use a radio (broadcast) communications system, they do not have to be in visual line of sight of each other; however, a *quasi optical* wireless path must be viable. Range is power-class-dependent, but effective ranges vary in practice. Officially Class 3 radios have a range of up to 1 metre (3 ft), Class 2, most commonly found in mobile devices, 10 metres (33 ft), and Class 1, primarily for industrial use cases,100 metres (300 ft). Bluetooth Marketing qualifies that Class 1 range is in most cases 20–30 metres (66–98 ft), and Class 2 range 5–10 metres (16–33 ft). The actual range achieved by a given link will depend on the qualities of the devices at both ends of the link, as well as the air conditions n between, and other factors. The effective range varies depending on propagation conditions, material coverage, production sample variations, antenna configurations and battery conditions.

Most Bluetooth applications are for indoor conditions, where attenuation of walls and signal fading due to signal reflections make the range far lower than specified line-of-sight ranges of the Bluetooth products. Most Bluetooth applications are battery-powered Class 2 devices, with little difference in range whether the other end of the link is a Class 1 or Class 2 device as the lower-powered device tends to set the range limit.

In some cases the effective range of the data link can be extended when a Class 2 device is connecting to a Class 1 transceiver with both higher sensitivity and transmission power than a typical Class 2 device. Mostly, however, the Class 1 devices have a similar sensitivity to Class 2 devices. Connecting two Class 1 devices with both high sensitivity and high power can allow ranges far in excess of the typical 100m, depending on the throughput required by the application. Some such devices allow open field ranges of up to 1 km and beyond between two similar devices without exceeding legal emission limits. The Bluetooth Core Specification mandates a range of not less than 10 metres (33 ft), but there is no upper limit on actual range. Manufacturers' implementations can be tuned to provide the range needed for each case.

D. Ir Sensor

Infrared waves are not visible to the human eye. In the electromagnetic spectrum, infrared radiation can be found between the visible and microwave regions. The infrared waves typically have wavelengths between 0.75 and 1000µm.The wavelength region which ranges from 0.75 to 3µm is known as the near infrared regions. The region between 3 and 6µm is known as the mid-infrared and infrared radiation which has a wavelength greater higher than 6µm is known as far infrared.Infrared technology finds applications in many everyday products. Televisions use an infrared detector to interpret the signals sent from a remote control. The key benefits of infrared sensors include their low power requirements, their simple circuitry and their portable features.

E. Servo Motor

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration.[1] It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. Servomotors are not a specific class of motor although the term *servomotor* is often used to refer to a motor suitable for use in a closed-loop control system.

F. Ultrasonic Sensor

Ultrasonic transducers or ultrasonic sensors are a type of acoustic sensor divided into three broad categories: transmitters, receivers and transceivers. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound. In a similar way to radar and sonar, ultrasonic transducers are used in systems which evaluate targets by interpreting the reflected signals. For example, by measuring the time between sending a signal and receiving an echo the distance of an object can be calculated. Passive ultrasonic sensors are basically microphones that detect ultrasonic noise that is present under certain conditions.

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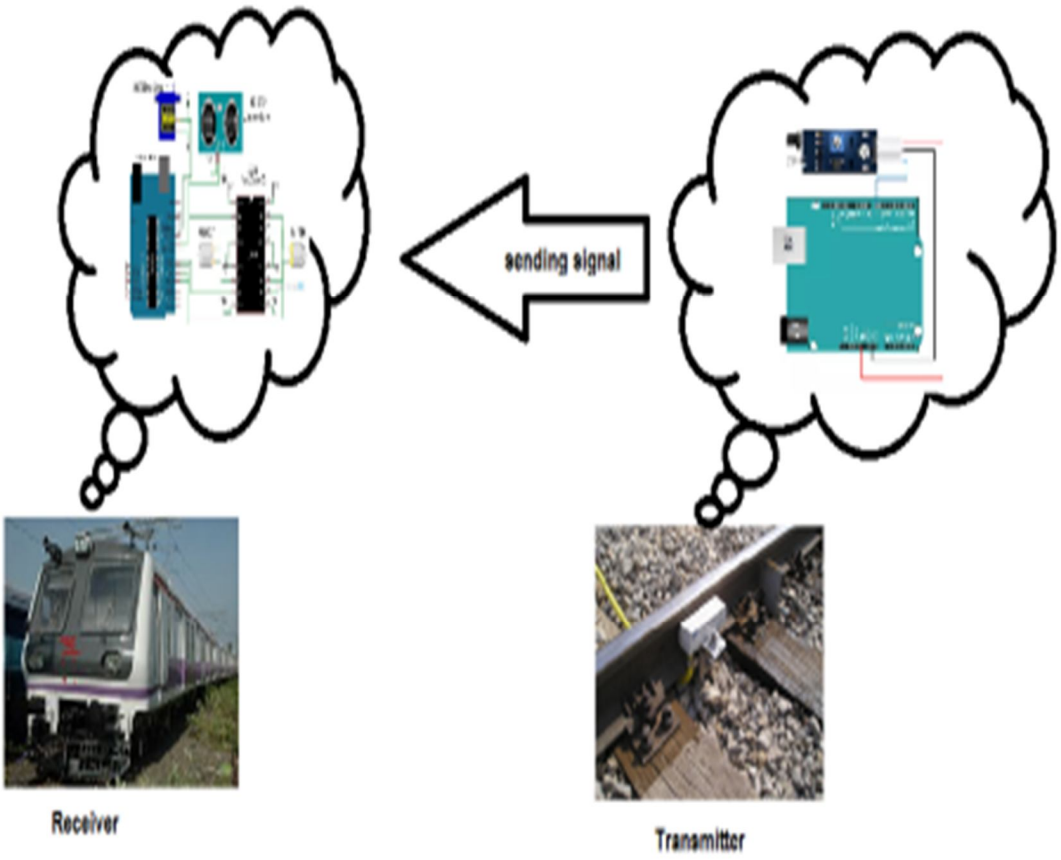
G. Design



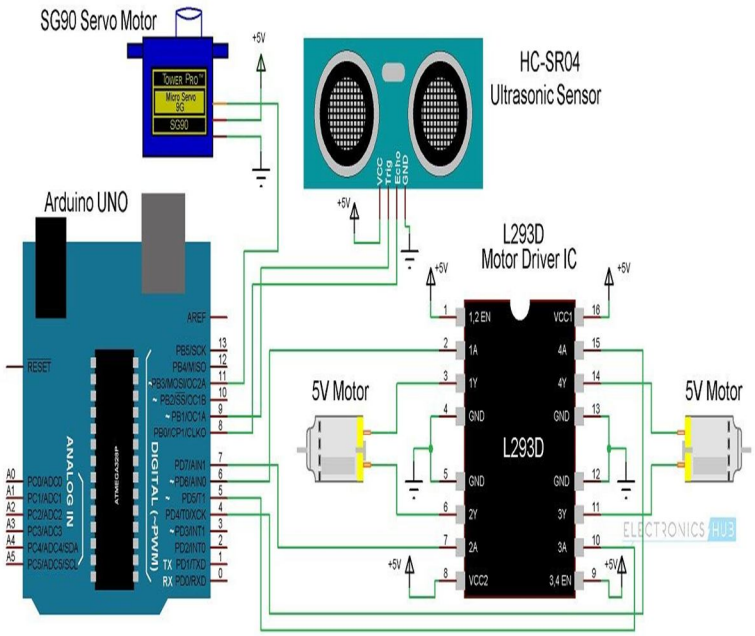


Fig: Receiver

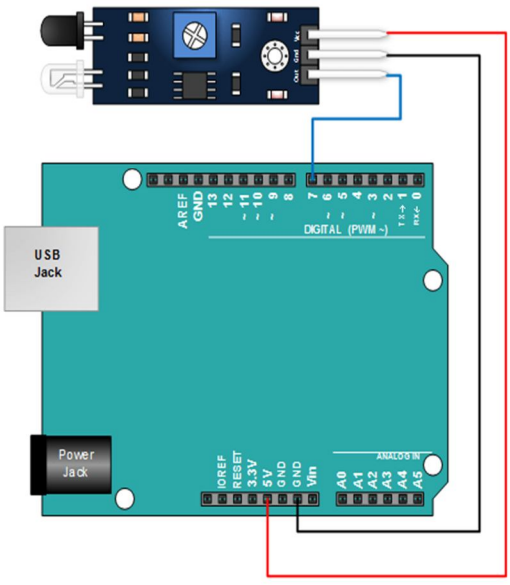


Fig: Transmitter

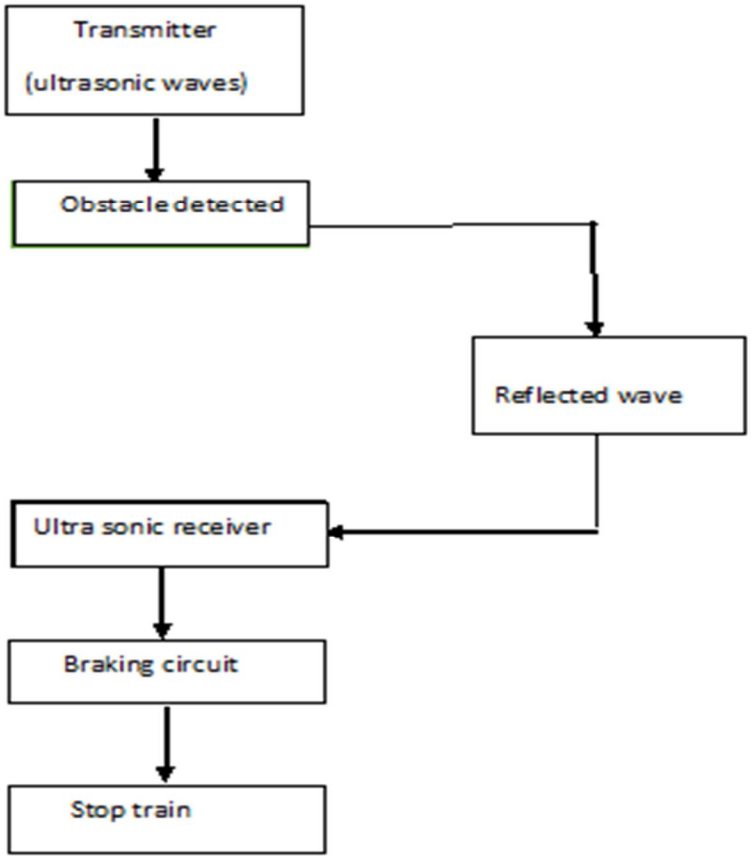


Fig:flow chart for obstacle detection

H. Working Of System

In this project we are mainly concentrating on the safe transportation of train without any collision. The accidents mainly occurs due to breakage of track, head on and rear end collison, obstacle detection, automatic path change, locating train location.

We use Arduino nano board for installing programs for both transmitter and receiver section,

IR sensors are used for transmission of signal, Ultrasonic sensors are used for obstacle detection. Power relay are placed in the track if the break of track leads breaking of circuit which alerts train through IR sensors with the exact location of crack in the track and automatically stops the train, Ultrasonic sensors are used for obstacle sensing and also avoids the head on and rear end collison, Ultrasonic sensors emits the waves and detects the object distance, if the object distance is lesser than the safety distance value it automatically decrease the speed of train and finally it stops.

IR sensors are placed for locating the train location and it is monitored on display, this helps in the proper location of every trains and it avoids collision of the trains.

Servo motor is used for the track changing mechanism, sensors are placed in the tracks it detects the train presence in the track and signal is sent to the system, and railroad switch is connected to the servo motor which rotates motor at a particular angle leads to the track change and other train is moved to secondary track. It leads to the decrease of man power and also the human error.

I. Future Enhancement

The Paper has a very vast scope in future. The proposed system can be further upgraded in future to make a centralized control system for all trains. Prediction algorithm can also be launched in the system to prevent collisions.

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IV. CONCLUSION

The main intension of the project is to prevent train collisions. By using this project many human lives can be saved. This project can work in any atmospheric conditions. Without any human involvement the trains will automatically stops. Through this innovative technique of early sensing of any possible collision scenario and avoiding it thereof, we demonstrate that it is a possible way to improve the overall safety of the railway system in India. We believe that success depends on both the railway industry.

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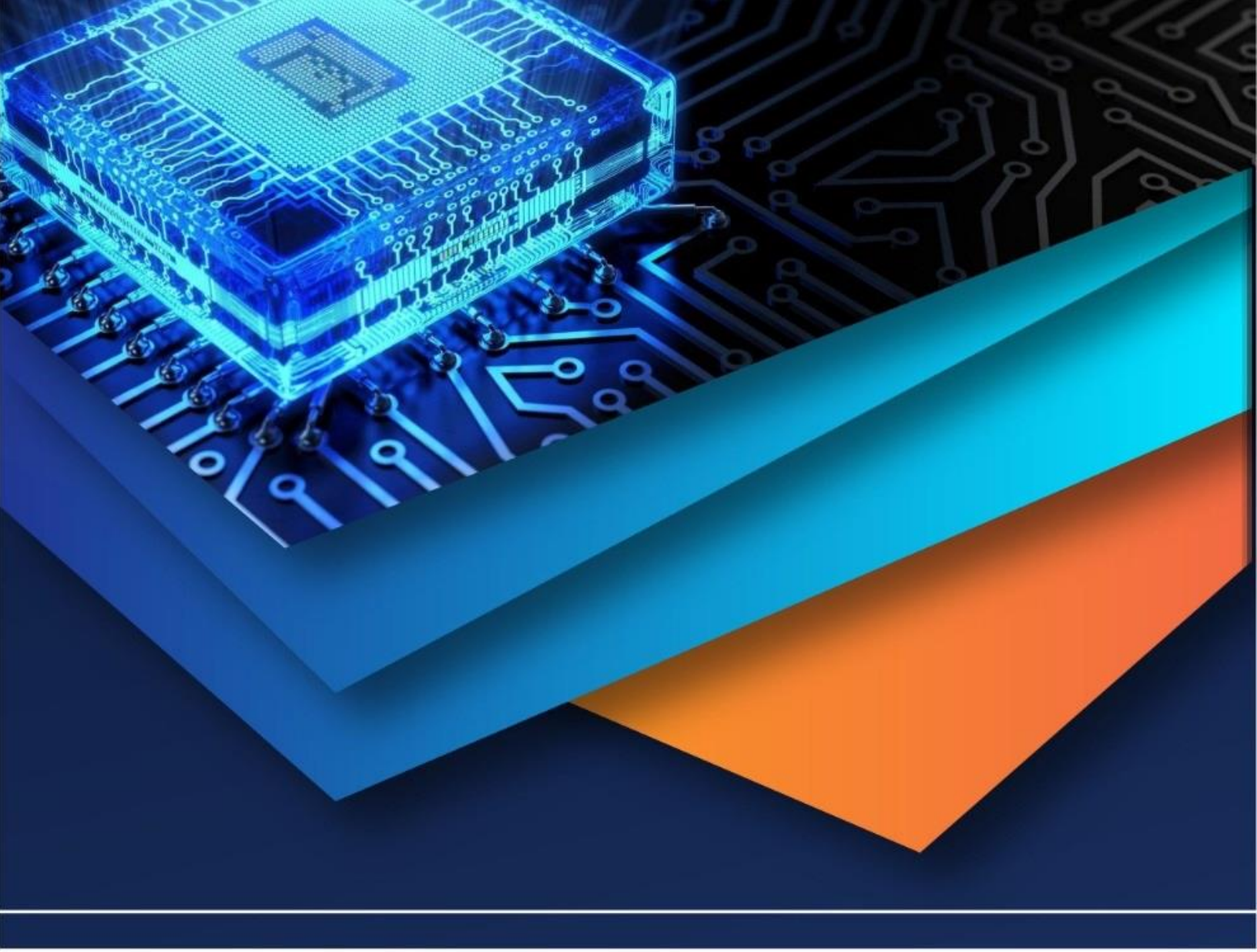

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