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Detachable Shuddering Device for Visually Impaired People

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Abstract: ***Our eyes are an important part of our health. Everyone rely on their eyes to see universe and make sense around them. Therefore, over the last decades, the development of navigation devices capable of guiding the blind through indoor and outdoor scenarios that has remained a challenge. Many researchers are working to assist visually impaired people in different ways like camera based assistance , voice based assistance , ultrasonic based assistance and in some advance way like transplantation of real eyes but that's not possible in every case. The main idea of the proposed system is to make person aware of the path and the obstacle in path they are walking. Blind people do lead a normal life, but they definitely face troubles. Let us have an emphatic look at some of their daily life problems and challenges faced by them. The biggest challenge for a blind person especially for one with complete loss of vision is navigation. Obviously blind people roam easily around their familiar atmosphere without any help. But what when they are at unfamiliar place at that time the most valuable thing for a disabled is gaining independence. Conditions like cataract, glaucoma, diabetic-related retinopathy, macular degeneration are some eye disease that can lead to vision loss so instead of showing sympathy to give them an empathetic look here a vibrating hardware is presented. Because vibration is something that could be felt by everybody due to that we present a shuddering hardware for visually impaired people for the purpose of navigation.***

Index terms: Visually impaired , Blind , Smart vibrating shoes , Navigation , Obstacles .

I. INTRODUCTION

Over the years there has a great increase in the count of blind people due to cataract, refractive errors, glaucoma, etc. The leading causes of blindness and vision impairment are cataract and uncorrected refractive errors. According to the survey the people of age more than 50 years have vision impairment. Although, vision loss can effect people of all ages because of some particular disease. The most common eye diseases leading to vision loss are cataract which means clouding of your eye's lens; Diabetes related retinopathy that is due to the damage of blood vessels in the retina due to high glucose levels; Glaucoma is due to high fluid pressure in the eyes then normal; Macular degeneration which is due to affect in central vision that damages the macula (centre area of retina) and so on. For this till now many researchers have develop assistive technologies and aids, some of existing methods are Braille, guiding dog, canes, JAWS screen reader. From this the assistive aids for navigation are canes but not that effective, then guiding dogs but expensive and tactile tile paving that is good for blind but may cause difficulties for others. Here a new device is introduced , this device is able to detect and alert the blind people about the incoming obstacles in their route. This system accurately sense objects and guide visually impaired people. This is comfortable device that will detect the nearby obstacles and send a message in the form of vibration to the receiver. So, it would help the visually impaired people to acquire the extra knowledge about the obstacles in the surroundings without any guidance. Here a wearable system is designed to provide directional information to those visually impaired persons in surrounds around designing a gadget for visually impaired individual that would assist them for travelling freely without any problems. This device will work as 'EYE' for an 'I'.

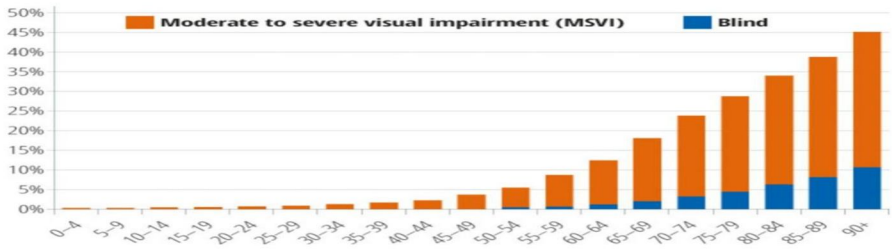

FIG. 1 Graphical representation of ages having blindness and MSVI[17]

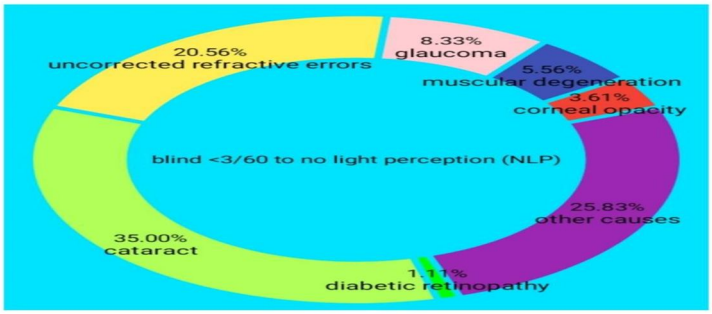

FIG. 2 Graphical representation of percentage of people having blindness and it's causes

II. LITERATURE SURVEY

A. Smart Shoes – An Aid to Blind People – IJARCCE

This paper consists of ultrasonic sensor pedometer sensor module and water sensor. Ultrasonic sensor detects obstacle within 3m. Power supply is by DC power supply of 12 volt. Here controlling unit is Arduino UNO. It consists of buzzer, vibrating motor and android app (through Bluetooth module for output) which helps in deciding routes to reach at desired position.

B. Design and Evaluation of Vibrating Footwear for Navigation

It consists of a mobile phone and haptic shoes. Here controlling unit provides directional instructions. On receiving the instructions combine with shoes and produces unique patterns. System consists of 3 functional modules, first is a sensing module, second is an inference engine to determine proper navigational instructions based on the environment conditions , third is a user interfaces to transfer navigation instruction to user. It also consists of force sensor, Bluetooth circuit, vibrating motor and a micro-controller.

C. Smart Assistive Shoes for Blind People

This paper is about assistive shoe for blind people which will help them in their needed activities. This shoes will detect nearby objects or obstacles and simultaneously send a message to the receive in audio / vibration form. Here shoes contains 3 ultrasonic sensor, one Arduino UNO, one recordable chip and vibrator / motor. Ultrasonic range is 3m. In this battery life is 5 hours.

D. Smart Navigational Shoes for Visually Impaired Person

In this an idea is proposed of making a device based on android and electronic kit. Barrier will be detected by sensors and vibrators will vibrate according to direction of obstacles. In this device there is no need of carrying any smartphone.

III. PROPOSED SYSTEM

Here a circuit is designed on printed circuit board to make is as small and comfortable it can be. This circuit consists of main components like ultrasonic sensor, vibrating motor, piezoelectric buzzer and ATtiny85. The main principle of our project is helping visually impaired people by using vibrations because it can be felt by everyone whether the person has any impairment or not. With the help of lithium – ion battery, the ultrasonic sensor would sense the obstacles and the microcontroller ATtiny 85 would help in giving command to the coin vibrating motor and piezoelectric buzzer for producing vibration and sound to aware the visually impaired people about obstacles. And therefore by this they will also start walking independently.

IV. PROPOSED DESIGN

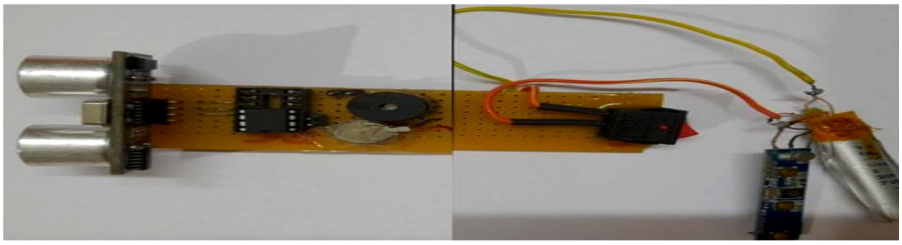

FIG. 3 Prototype Model

V. SCHEMATIC DIAGRAM

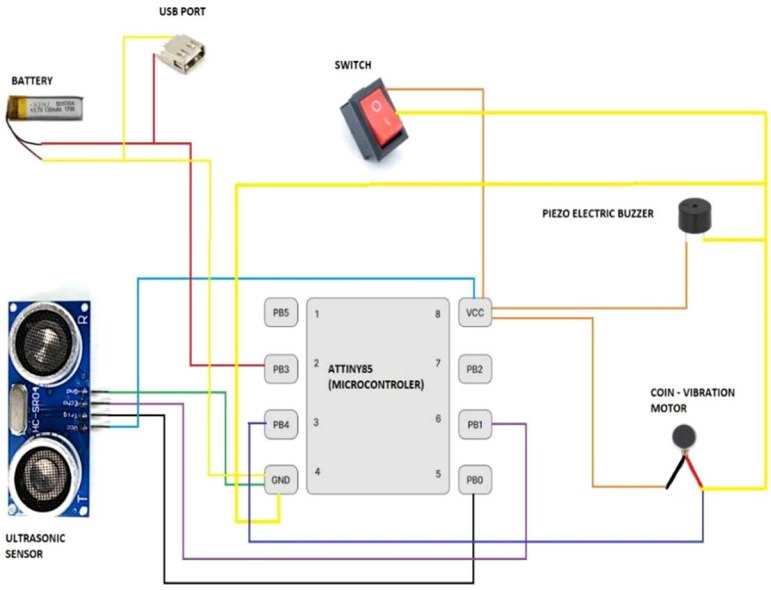

FIG. 4 Schematic diagram of circuit

VI. FLOWCHART

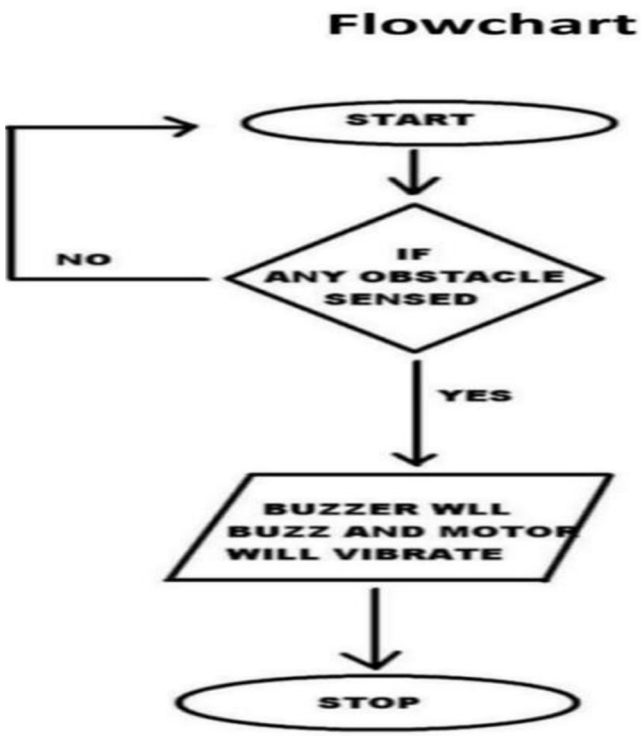

FIG. 5 Flowchart of whole process

VII. BLOCK DIAGRAM

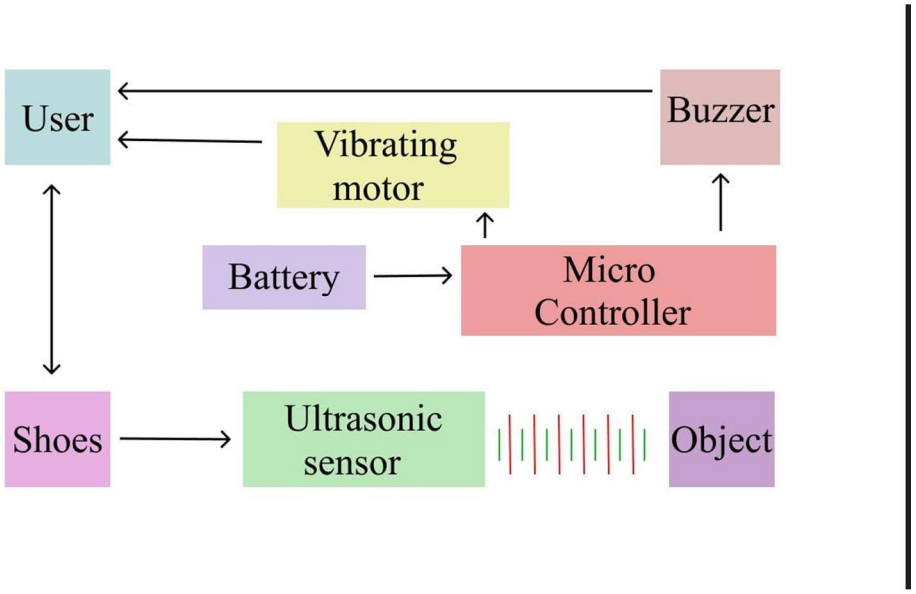

FIG. 6 Block diagram of the whole process

VIII. COMPONENTS

A. *ATtiny 85 (Microcontroller)*

ATtiny85 Microcontroller is a small 8-pin AVR microcontroller with high performance and is based on RISC advanced CPU architecture. It is available in 2 package types, which are used to interface and control various devices and sensors. It consumes low power and is available in small size with a program memory size of 8 Kbytes, EEPROM, and RAM of 512 Kbytes to store the code of the given instruction. It is also known as a small Arduino chip with few I/O pins, limited flash/program memory, SRAM, and EEPROM. For a small code, the ATtiny85 microcontroller chip is used instead of using ATmega328p or Arduino board. To get input from sensors, 3 pins are used as analog inputs from these limited I/O Pins. ATtiny85 microcontroller is a small 8-pin AVR controller. It has 8 I/O pins, in which 6 I/O pins are used for multiple functions and the other 2 pins are power pins used for VCC and GND. These 6 I/O pins are also known as PORTB pins, which are used as inputs or outputs based on the application. In ATtiny85, the PORTB pins are labeled as PB0, PB1, PB2, PB3, PB4, and PB5. The power pin VCC is connected to the supply and the GND pin is connected to common ground.

Fig. 7 ATtiny85 [1]

B. *PCB (PRINTED CIRCUIT BOAR)*

Perfboard is a material for prototyping electronic circuits (also called DOT PCB). It is a thin, rigid sheet with holes pre-drilled at standard intervals across a grid, usually a square grid of 0.1 inches (2.54 mm) spacing. These holes are ringed by round or square copper pads. Perfboard is a convenient platform for prototyping electronic circuits. It is a quick and easy way to mount and connect leaded electronic components and is easily changeable when testing new Configuration. Discrete components are soldered to the prototype board such as resistors, capacitors, and integrated circuits. The substrate is typically made of paper laminated with phenolic resin (such as FR-2) or a fiberglass-reinforced epoxy laminate (FR-4). The components are soldered in their designated locations, paying attention to orientation.

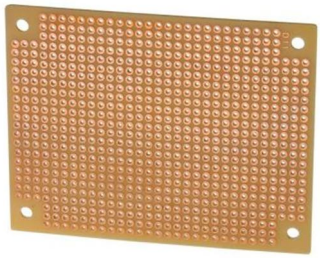

Fig.8 Printed Circuit Board(PCB) [2]

C. IC Holder

These connectors are designed to provide a compressive interconnect between component leads and a printed circuit board (PCB). Integrated circuit (IC) sockets are designed to provide a compressive interconnect between component leads and a PCB. IC sockets prevent damage to ICs caused by soldering IC chips directly to the circuit board. Instead, the more durable IC sockets are soldered to the board and the chip is simply inserted into the socket. IC sockets allow ICs to be inserted and removed easily. This IC has two parallel rows of pins extending perpendicularly out of rectangular plastic housing. This are made up of black thermoplastic and tin plated alloy contacts.

The socket is used when the IC is temperature sensitive and the heat from the soldering iron can damage the IC. This socket is used when working with a microcontroller IC and can be removed for programming. The IC can be removed from this socket when required. The IC is placed on the socket at the time of use. This base acts as a removable IC holder.

Fig. 9 IC holder [3]

D. Coin vibration motor

Coin vibration motors are the most popular and cost effective haptic motor, super small dimensions and enclosed vibrating mechanism . This kind of motors are widely used in mobile phones and wearable devices, it is available in diameter ranging from Ø7mm to Ø12mm. Coin vibration motor has small size and easy to use. Phone vibration motor is a popular choice for many different applications. Coin vibration motors are great for haptics. Coin-type vibration motor is comprised of a weight, a ring magnet, rotor with commutation points attached in the front and coils assembled on the back, and power supplied brushes attached to the ring magnet. The commutation points, which are in contact with the end of the brushes.

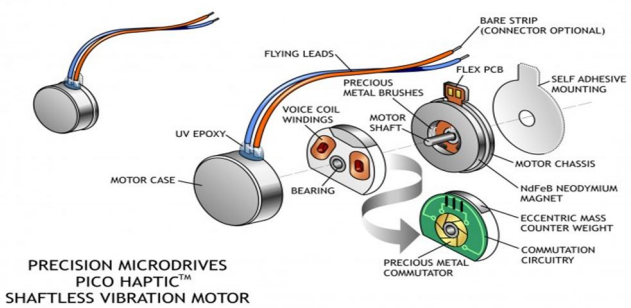

Fig. 10 Coin Vibrating Motor [4]

E. Switch

This Rocker switch works on SPST (Single Pole Single Throw) mode. This switch is rated for a load of 6A 250V and 10A 125V. The contact resistance of the switch is ≤ 20 MQ and insulation resistance of the switch is ≥100MQ. SPST Round Rocker switches have two positions which are ON and OFF. To make identification of the position of the button easy ON and OFF positions are clearly marked on the button as I and O respectively. Dimensions are L 20.5 mm, x W 14 mm x H 20 mm.

Fig.11 Switch [8]

F. Piezoelectric buzzer

A piezo buzzer works by applying an alternating voltage to the piezoelectric ceramic material. The introduction of such an input signal causes the piezoceramic to vibrate rapidly, resulting in the generation of sound waves. Piezo buzzers: Piezo buzzers have larger frequency ranges and SPL values, as well as a high resonant frequency. Piezo buzzers also have higher operating voltages and lower current requirements. In simplest terms, a piezo buzzer is a type of electronic device that's used to produce a tone, alarm or sound. It's lightweight with a simple construction, and it's typically a low-cost product. piezo buzzers normally consume less than 30 milliamperes — even at higher rate frequencies

Fig.12 Piezoelectric Buzzer [5]

G. Ultrasonic sensor

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting Ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target). Ultrasonic sensors are also used in robotic obstacle detection systems, as well as manufacturing technology Ultrasonic transducers operate at frequencies in the range of 30–500 kHz for air-coupled applications. As the ultrasonic frequency increases, the rate of attenuation increases.

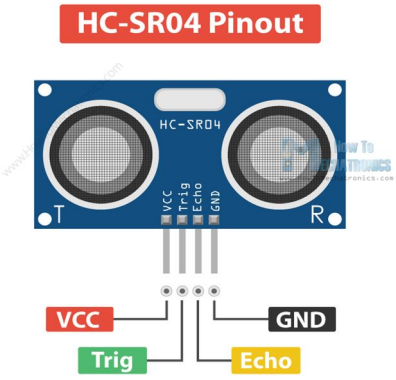

Fig. 13 Ultrasonic Sensor [6]

H. Battery

3.7v 210mAH (Lithium Polymer) Lipo Rechargeable Battery also known as Lipo or Lipoly batteries are Thin, light and powerful. This battery has a capacity of 210mAH. These Batteries are are widely used in GPS, DVD, iPod, Tablet PC, MP4 player, Power Bank Supply, Bluetooth Speaker, IOT and other DIY and Industrial applications.

I. USB (UNIVERSAL SERIAL BUS)

USB is defined as an acronym that stands for Universal Serial Bus which is a type of computer port which can be used to connect equipment to a computer. An example of a USB is the interface used to upload pictures from a digital camera to a computer. when a peripheral device is attached via USB, the host computer will detect what kind of device it is and automatically load a driver that allows the device to function. Here it is used in order to charge the battery.

Fig. 14 USB (Universal Serial Bus) [7]

1) Advantages

a) Works properly and give accurate results
b) Comfortable
c) Rechargeable
d) Detachable

2) Disadvantages

a) Can't work in water or in rainy season

IX. FUTURE SCOPE

1) We are going to make it waterproof.
2) Joining Bluetooth module

X. CONCLUSION

In the world many people are facing the problem of visual impairment that prevents them from being independent . This vibrating shoes will help them to get rid of stick / dog , as it is comfortable and cheap . It is based on tactile display for navigation. It is accurate in detecting the obstacle and alerting the visually impaired person find their way by passing every obstacle that comes on their way to the destination. The shoes are comfortable and user friendly.

XI. ACKNOWLEDGEMENT

We would like to thank our guide Shivrajsinh Rayjada who gave us this opportunity.
Secondly, we would like to express our special thanks of gratitude to our parents and other family members especially Nilesh Vaghasana for guiding us throughout the project .

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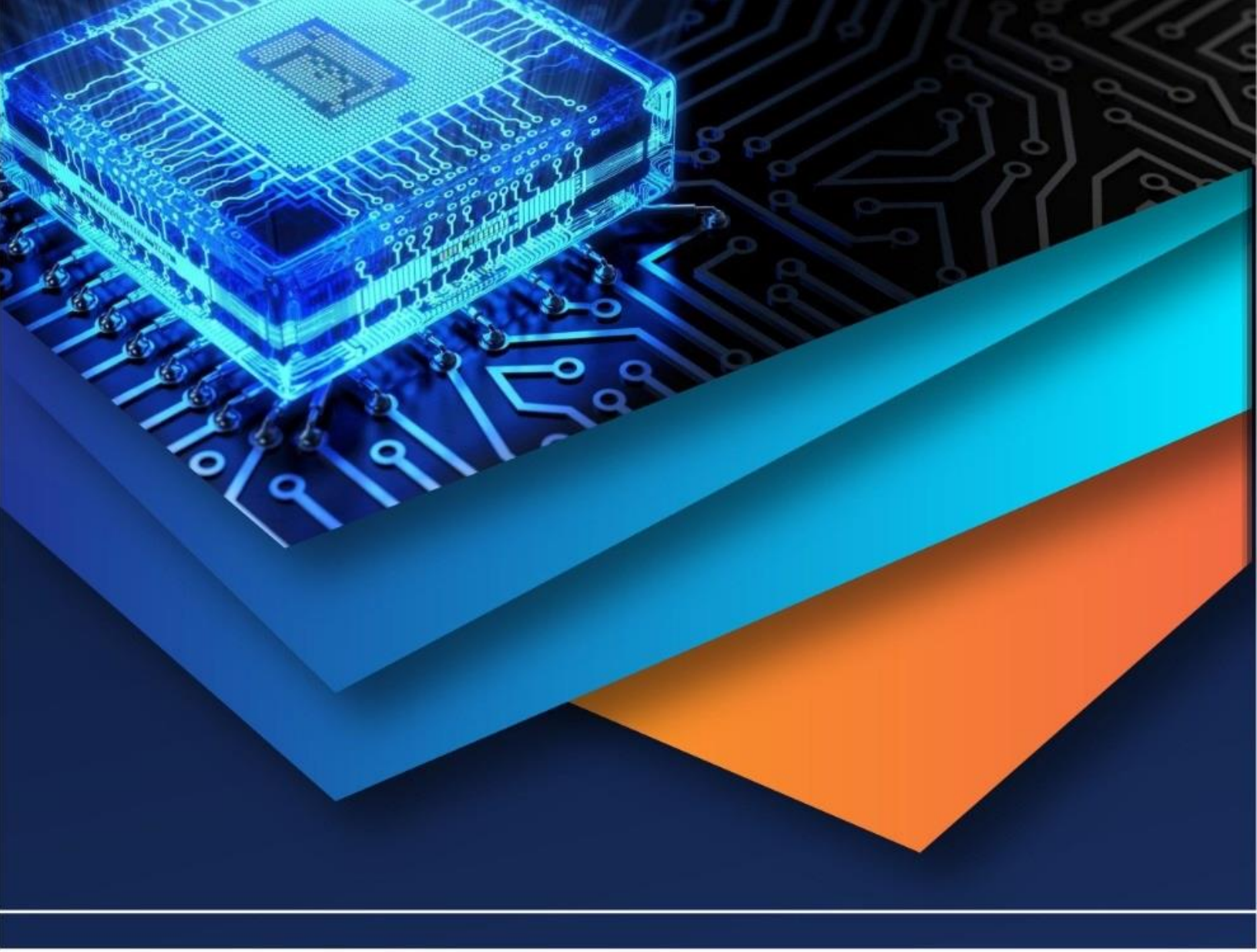

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