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Automated Mobility and Orientation System for Blind People

B.P.V. Subba Rao[1], S. Affrid[2], P. Haseena[3], N.S.S.S. Rajiv[4], P. Rajeswari[5]
[1, 2, 3, 4, 5]*Department of Electronics and Communication Engineering, St. Ann's College of Engineering and Technology, Chirala, A.P. (India)*

Abstract-The aim of this paper is to make the visually impaired people comfortable while walking on the roads as well as travelling through the buses. It also aims to find obstacles, living things or objects etc. in the exterior surroundings. It also proposes to make visually impaired people to overcome the dangerous areas like drainages, canals, lakes etc. Moreover, it is also used for bus boarding and detection using RFID.
Keywords-Ultrasonic Sensor, PIR Sensor, Soil Moisture Sensor, RFID Reader, RFID Cards

I. INTRODUCTION

Blindness is the state or condition of being unable to see because of injury, disease, or a congenital condition [1]. It is the loss of useful sight. This blindness can be caused in many ways in people of different age groups, some may be blind by birth, some due to malnutrition, some by accidents and some due to cataracts ,trachoma etc. Blindness also occurs due to neurological and physiological problems. From the survey of WHO, it is estimated that 253 million people are with vision impairment, where 36 million are blind and 217 million have moderate to severe vision impairment. 81% of people who are blind or have moderate or severe vision impairment are aged 50 years and above [2].

The main objective of this project is to secure a safe, low cost navigation for the blind/visually impaired individual. Since the blind people are strong at their hearing, compared to the normal people. The proposed system focused on alerting the blind people using voice feedback system [5]. In addition, it helps blind or visually impaired travelers to roam safely and quickly among the obstacles and other accidents faced by blind pedestrians that may lead to death etc. The proposed obstacle detection system consists then in sensing the surrounding environment via sensors to the user of the position of the closest obstacles in range.

This paper mainly concentrates on three components sensing the surrounding environment against obstacles for the visually impaired, warning about obstacles and for providing the bus information by means of voice feedback system. The project aim is to concentrate on the following things: Detection of immediate obstacles in the surroundings using ultrasonic sensor HC-SR04, motion detection using PIR sensor, moisture detection using soil moisture sensor which make blind people from getting affected from the wet places and easy transportation through buses using RFID reader for getting information about bus routes and their numbers [10].

II. WORKING PRINCIPLE

The system consists of an Arduino Uno, an ultrasonic sensor, a PIR sensor, a soil moisture sensor, a RFID reader, a RFID card and Headphones. Figure 1 shows the proposed block diagram of the system. Here,

1) The system is activated with the power supply applied to it.
2) The Arduino Uno helps in interfacing and processing the signals.
3) Whenever obstacle is detected, it informs the blind through the voice feedback system.

In this project, there is no special usage of IC's or different equipment for the generation of the voice; the Arduino itself is used as voice feedback system. The above components are discussed in the hardware description.

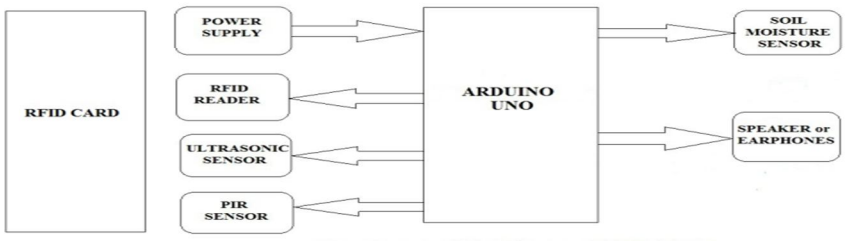

Figure 1 The proposed blind navigation system

III. HARDWARE DESCRIPTION

A. Arduino UNO

Arduino UNO is an AVR ATMega328P microcontroller-based development board with six analog input pins and 14 digital input/output (I/O) pins in which 6 are PWM pins [3]. In this project, 5 digital pins and 1 analog pin is used. The microcontroller can operate at a clock frequency of 16 MHz. The Arduino UNO supports serial communication via UART. The Arduino UNO can be supplied with power either from DC power jack (7–12V) or from USB connector (5V).

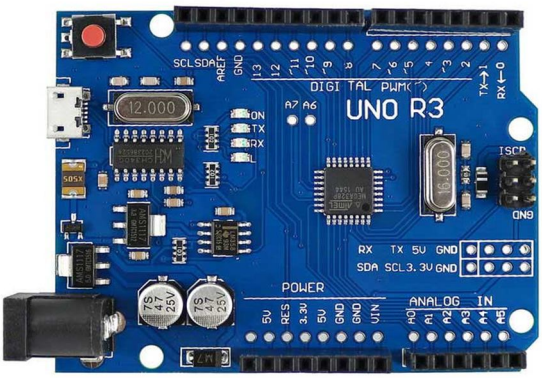

Figure 2 Arduino UNO

B. Ultrasonic Sensor

An ultrasonic sensor is a device that can measure the distance of an obstacle or object by using sound waves. It measures the distance by sending sound wave of specific frequency and listen for it when it is bounced back. An ultrasonic sensor has power supply: +5V, working current: 15mA, ranging distance: 2cms - 400cms, measuring angle: 15 degrees, trigger input pulse width: 10us [6].

Figure 3 Ultrasonic sensor

Below figure shows the flow chart of ultrasonic sensor.

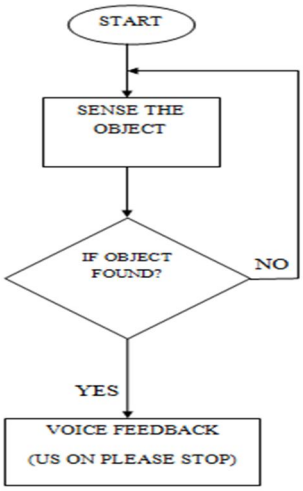

Figure 4 Flow chart of ultrasonic sensor

C. PIR Sensor

A passive infrared (PIR) sensor is an electronic sensor that detects motion by receiving infrared (IR) radiation radiating from objects in its field of view. A PIR sensor has supply voltage: 5V. It has a sensor assembly with two independent sensing elements with low noise and high sensitivity. It is delay time adjustable and produces standard TTL output [7].

Figure 5 PIR sensor

Below figure shows the flow chart of PIR sensor.

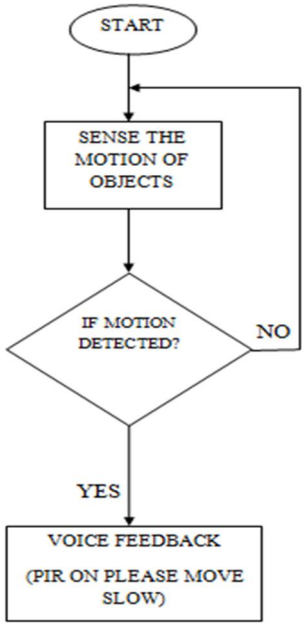

Figure 6 Flow chart of PIR sensor

D. Soil Moisture Sensor

A soil moisture sensor measures the volumetric water content in soil. A soil moisture sensor has supply voltage: 5V. It has excellent stability and is immune to electricity. The sensor blade is constructed of a multi-layer fiberglass. It has a built-in temperature sensor used while calibrating the soil moisture readings [9].

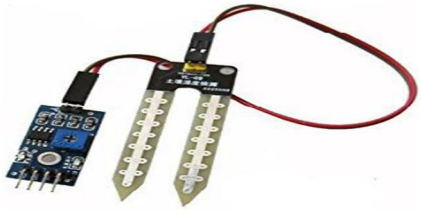

Figure 7 Soil Moisture sensor

Below figure shows the flow chart of soil moisture sensor.

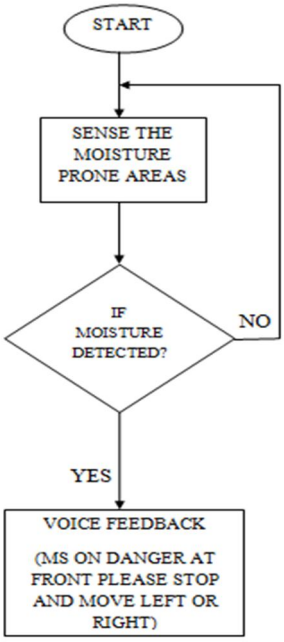

Figure 8 Flow chart of soil moisture sensor

E. RFID Reader And RFID Card

The EM-18 RFID reader module supports 5V DC power supply. The distance for which this RFID reader reads is up to 10 cms. The operating frequency for RFID reader is 125 KHz. This RFID reader module works with any 125 KHz RFID cards.

RFID cards have operating frequency of 125 KHz. They are pre-programmed with unique ID number. An RFID card supports contactless transmission of data and supply energy.

Figure 9 RFID reader & RFID card

Below figure shows the flow chart of RFID reader and RFID card.

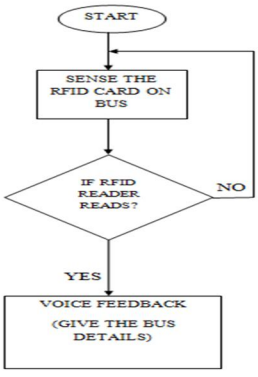

Figure 10 Flow chart of RFID reader & RFID card

IV. SOFTWARE DESCRIPTION

The software used here is Arduino Integrated Development Environment (IDE). It is easy to write code and upload it to the board through Arduino IDE.

It contains easy installation procedure. It runs on different operating systems such as Windows, Mac OS X, and Linux. The Arduino language is merely a set of C/C++ functions that are used in code. The environment of this software is written in JAVA and based on processing and other open source software. Programs written using Arduino software are called as sketches. This software is connected to the Arduino hardware board to upload programs and communicate with them. This software can be used with any Arduino board [8].

V. ADVANTAGES

1) Low cost.
2) The system helps in moving on roads as well as boarding the buses.
3) Low power consumption.
4) Accurate in detecting different obstacles.
5) The destination can be found very easily.
6) The design time for the system is also less.

VI. RESULTS

The following figure shows the circuit of the blind system.

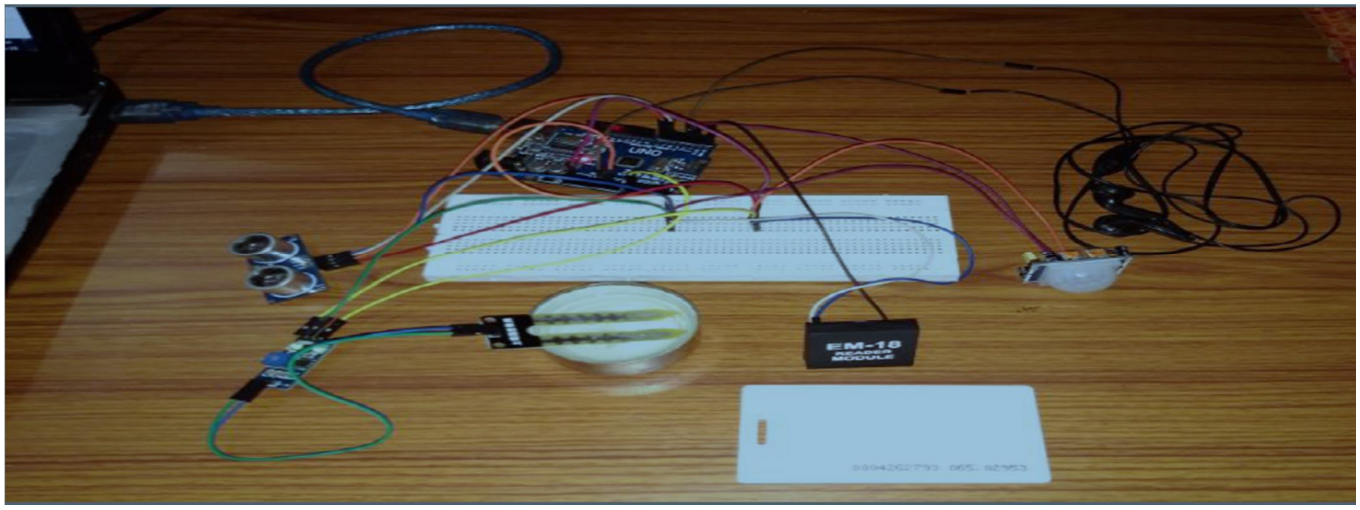

Figure 11 Circuit of blind system

The figures below show the results related to this project.

Figure 12 Result of ultrasonic sensor

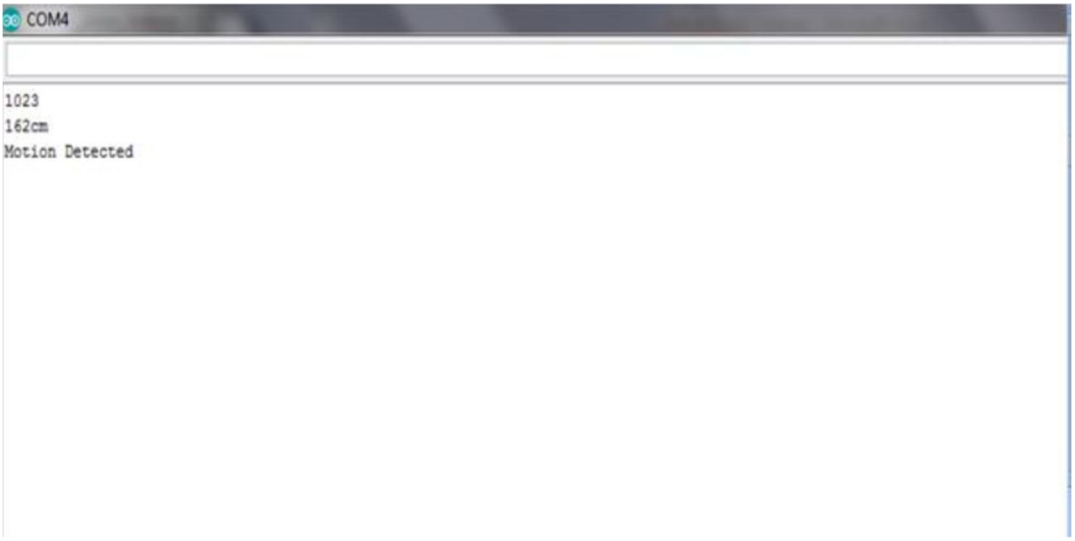

Figure 13 Result of PIR sensor

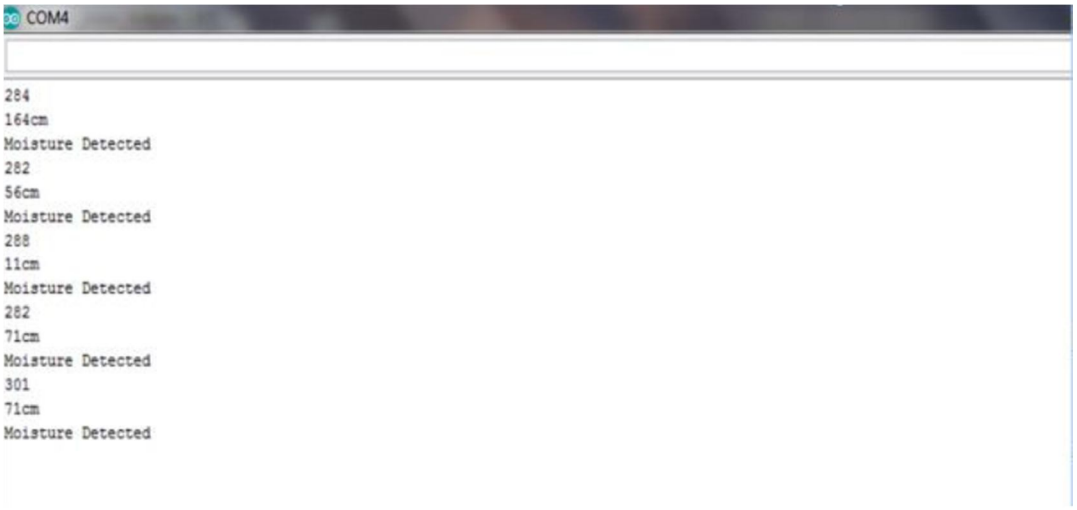

Figure 14 Result of soil moisture sensor

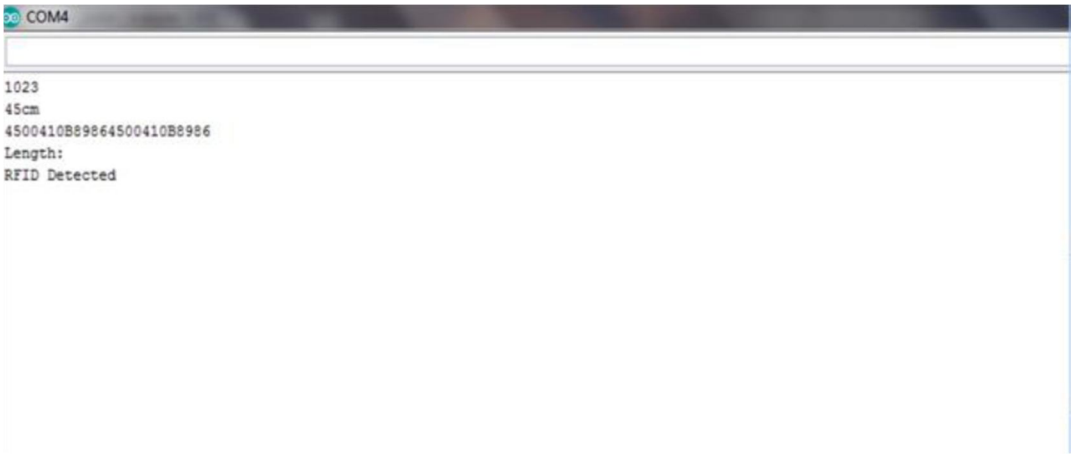

Figure 15 Result of RFID reader

VII. CONCLUSION AND FUTURE SCOPE

The project "Automated mobility and orientation system for blind people" goal is to provide safe and secure navigation for the blind people in any circumstances like roaming on the roads as well as boarding the buses [4]. The system is efficient and unique in specifying the source and destination that may encounter by the blind. With this project, blind people can move from one place to another easily.

Future improvements will consist of making the system able to work more efficiently in the obstacle detection and helps in detecting more minute obstacles. More use of different sensors can be established for more secure mobility of blind pedestrian. A huge enhancement will be accomplished on the features and on the results, making this system closer to perfection.

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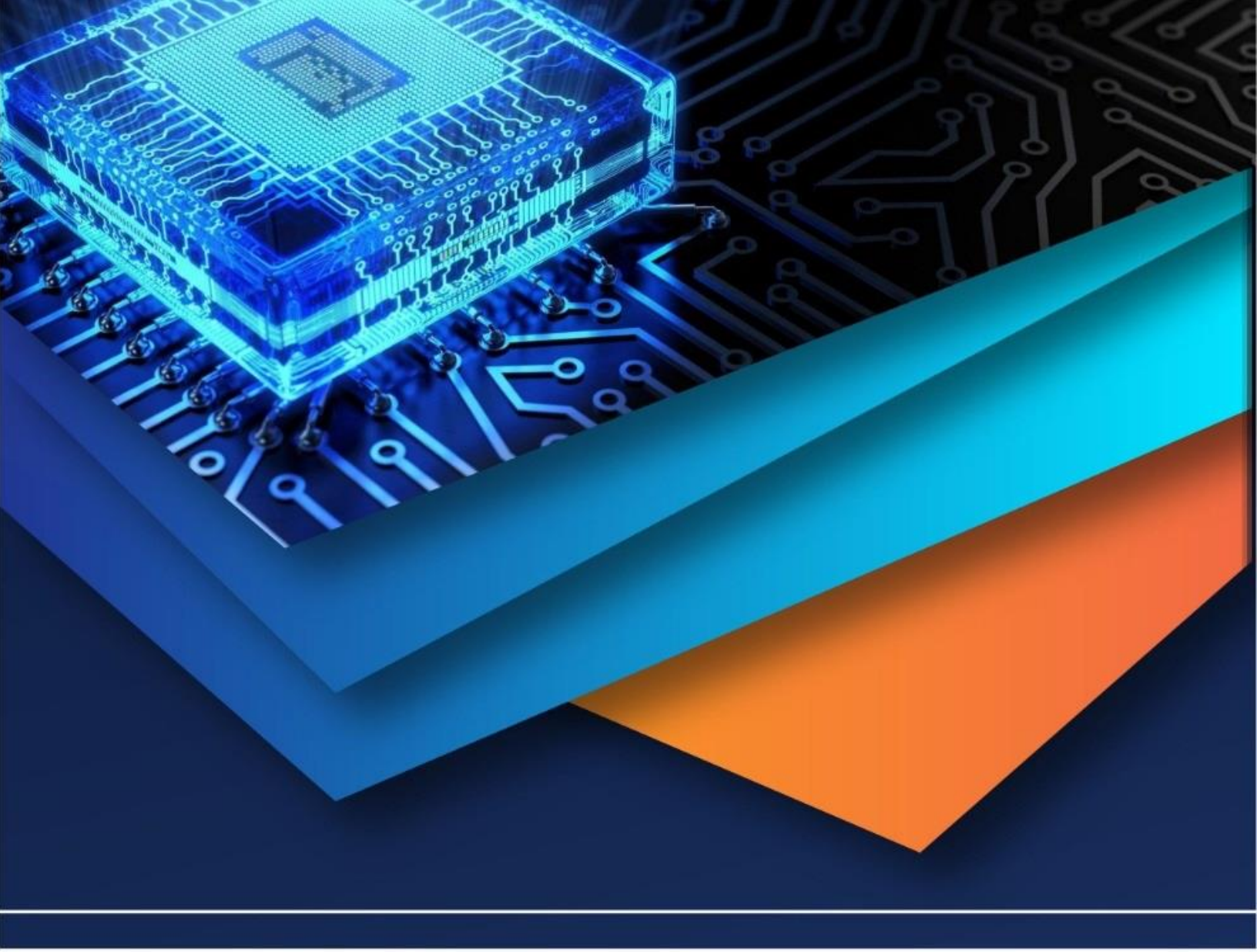

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