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Multifunctional Robot for Military Applications

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Abstract: ***The fastest-growing and most fascinating field in the modern world is robotics. A robot's input and output can sense its surroundings and respond accordingly. Scientists have developed military robots through technological advancement and study. Indicate in this section what needs to be modified. After that, select the paraphrasing option below. This increases the security of a soldier's life in combat. Military robots are employed to carry out a number of dangerous jobs, including shooting opponents, detecting landmines, disarming live unexploded explosives, and monitoring combat zones. These combat robots are outfitted with integrated systems, including grippers, cameras, sensors, and actuators. Self-contained robots are required because of the issues that soldiers and civilians are facing with terrorism and insurgencies. Nations invest a great deal of money in the development of new defensive systems that can protect their citizens from terrorist threats. Through the use of a robotic system that can monitor a variety of field conditions and transmit data to an Android application over Wi-Fi, the suggested solution eventually offers a remote monitoring and controlling capability.***

I. INTRODUCTION

Military robots detect and handle hazardous situations, such as detecting bombs and weapons, offering a cost-effective and efficient alternative to human labor. While robots have limitations, evolving technology aims to make them more versatile. Existing robotic systems face limitations in terms of operational range, manual control efficiency, and adaptability. The need for advancement in robotic technology is evident to address these challenges. To identify and navigate around obstacles while detecting the presence of metallic objects in the surroundings. To actively monitor and provide alerts for the presence of hazardous gases in the environment. To measure and display the temperature of the surrounding area, ensuring real-time awareness of environmental conditions. To integrate Wi-Fi module into multifunctional robot for enhanced situational awareness. Integrating a Wi-Fi module offers the potential for improved communication, data transfer, and remote-control capabilities. However, the current lack of a comprehensive solution hampers the development of a versatile robot for multifunctional applications.

II. FIGURES AND BLOCK DIAGRAM

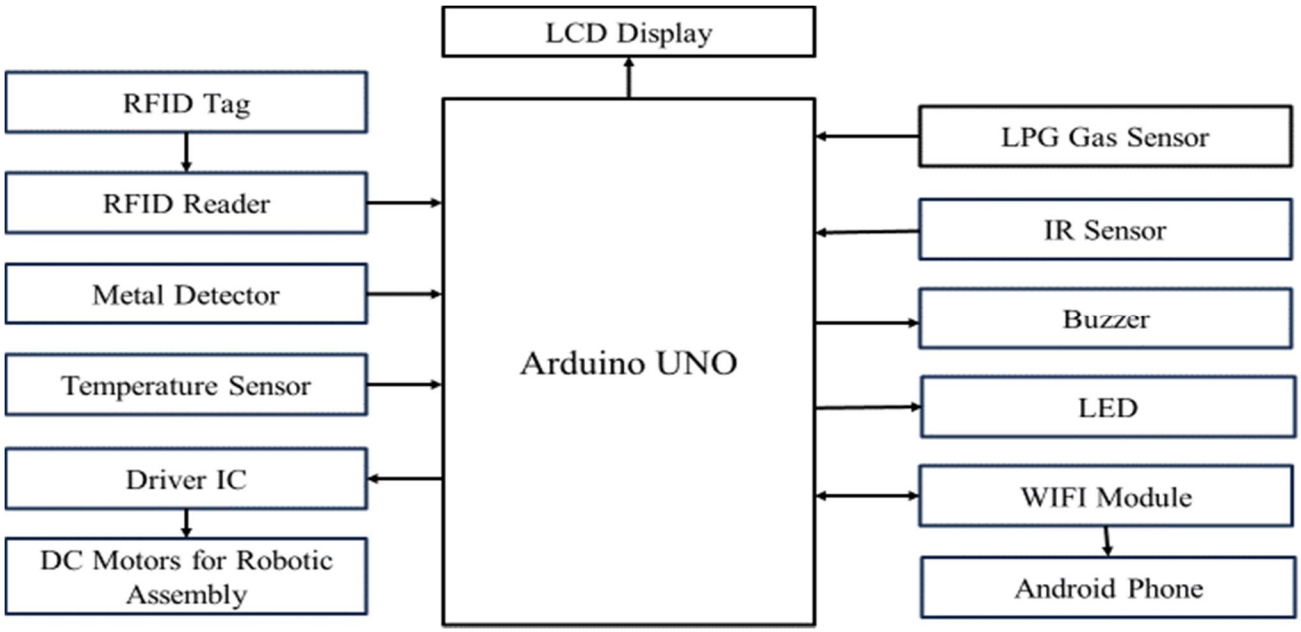

Figure 1 Block Diagram

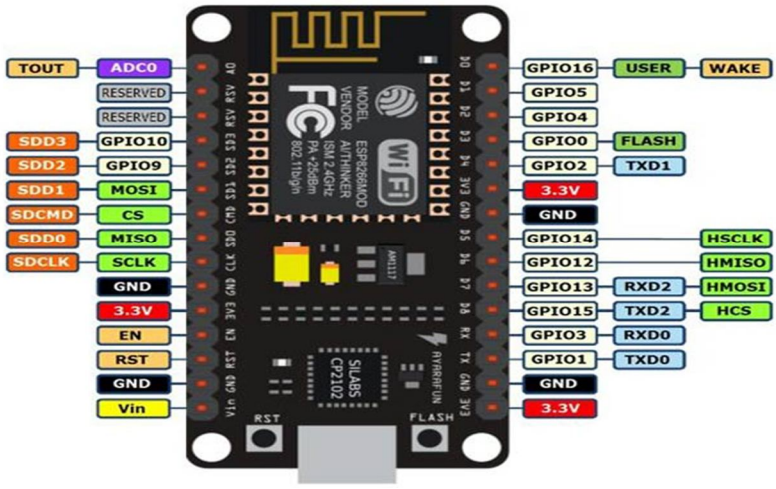

Figure 2 NodeMCU ESP8266 Pin Configuration

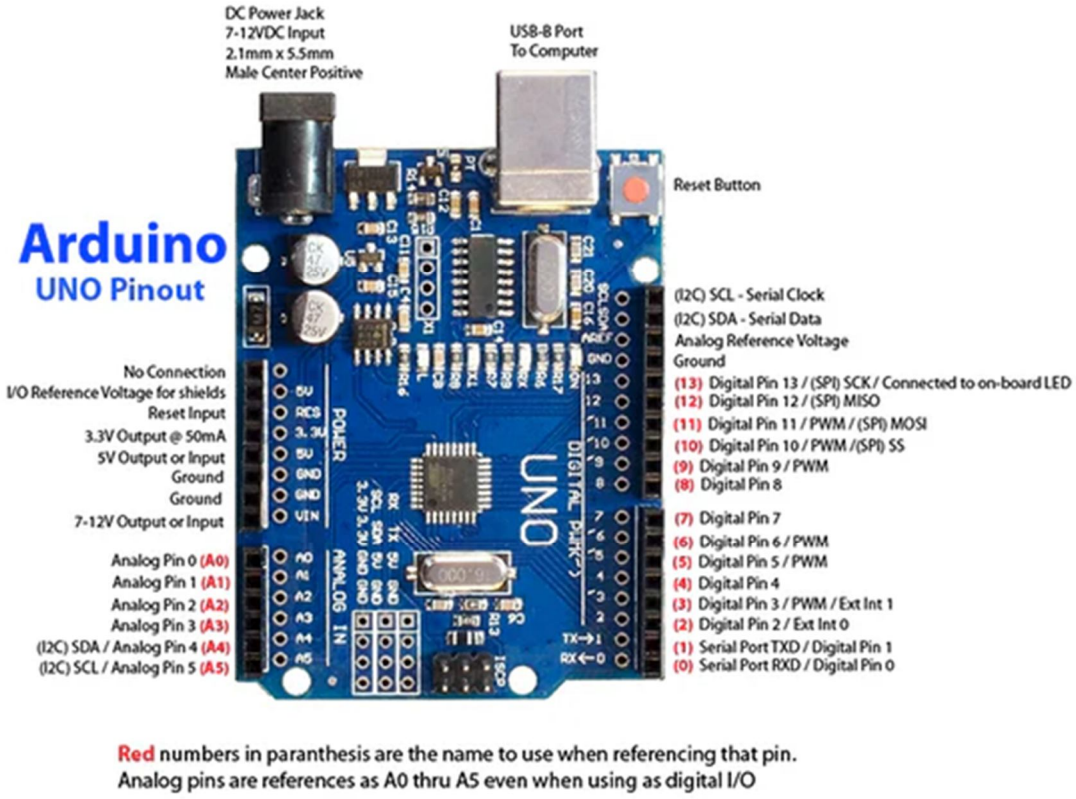

Figure 3 Arduino UNO Pin Configuration

III. WORKING

The system as shown in block diagram 1.1 consist of Arduino Uno, LCD display, RFID reader, IR sensor, Metal detector, LPG gas sensor, Temperature sensor, NodeMCU Esp32,DC motors. The robot will move by analyzing the obstacles in the path with the help of an IR sensor. The hazardous gases are detected like LPG with the help of a Gas sensor interfaced in the system for safety purposes. The RFID reader interfaced in a system for activation.

Infrared (IR) sensors emit infrared light and measure the reflection to detect obstacles. When an obstacle is in proximity, the emitted infrared light reflects off the obstacle and is detected by the sensors. The robot interprets this data to determine the presence and location of obstacles, enabling it to navigate around them.

The metal detection module utilizes electromagnetic induction. The robot incorporates a metal detector, typically a coil of wire. When the coil approaches a metallic object, the electromagnetic field around the coil is disrupted. This disturbance is detected, signaling the presence of metal.

The MQ2 gas sensor detects various gases by measuring changes in resistance. Positioned on the robot, the MQ2 sensor monitors the surrounding air. When it comes into contact with specific gases like propane, methane, or carbon monoxide, the sensor's resistance changes.

The LM35 temperature sensor produces a voltage proportional to the Celsius temperature. The LM35 sensor on the robot measures the ambient temperature. The voltage output corresponds to the temperature reading, allowing the robot to monitor temperature variations in its environment.

A mobile app is created that communicates with NodeMCU ESP32. This app displays data from sensors connected to the NodeMCU ESP32. App and the NodeMCU ESP32 communicate with each other over Wi-Fi. The NodeMCU ESP32 periodically collects data from sensors connected to it (such as temperature, gas, metal, obstacle,). It then sends this data to the mobile app, which can display it to the user in real-time.

IV. RESULTS AND DISCUSSIONS

In recent years with the advancement of technology, you can find use of machines in every industry. In military areas, where the soldiers are prone to various kinds of danger all the time. With the help of technology, we must aim to minimize their concerns and equip them with the latest techniques weapons, and surveillance support. In the military area, humans have some constraints as they can't travel in all types of terrains to chase down attackers. There is always a danger of loss of life. With the help of a wireless multifunctional robot, we can overcome all these challenges as we have a temperature sensor, gas sensor, obstacle sensor, and metal detector. As soon as the robot senses any of these it can take immediate action and even if it is destroyed it won't cause any grieve loss.

In this project, the robot remains in standby mode with all batteries connected, awaiting activation upon the recognition of an RFID card, as depicted in Figure 4. Once the RFID card is successfully read by the reader, the robot activates, as illustrated in Figure 5. As the robot commences movement, it actively detects the presence of gases, promptly showcasing the findings on the LCD screen, along with the corresponding temperature, as exemplified in Figure 6. Furthermore, in the event of an obstacle obstructing the robot's path, the LCD screen provides real-time notifications of the obstacle, accompanied by temperature data, as demonstrated in Figure 7.Mobile App displaying data from temperature sensor,gas sensor,metal sensor,IR sensor is shown in Fig 8.

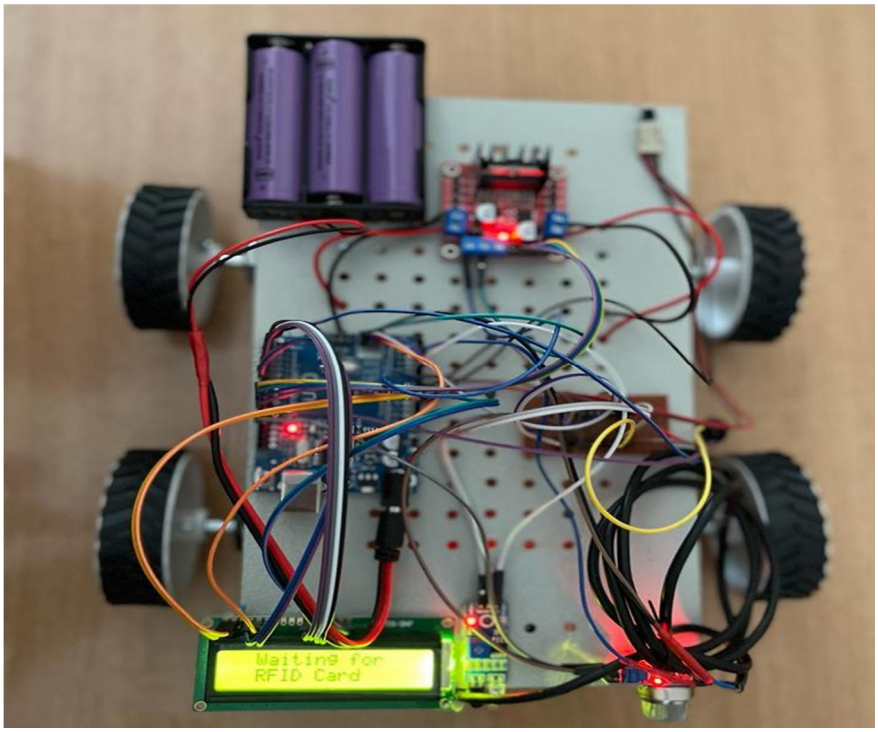

Figure 4 Robot waiting for scanning RFID card

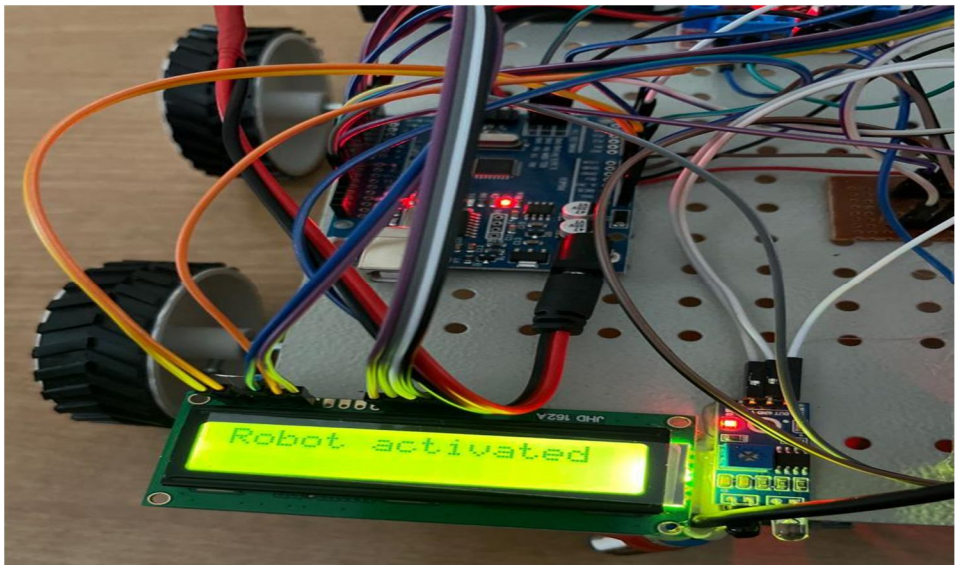

Figure 5 Activated Robot

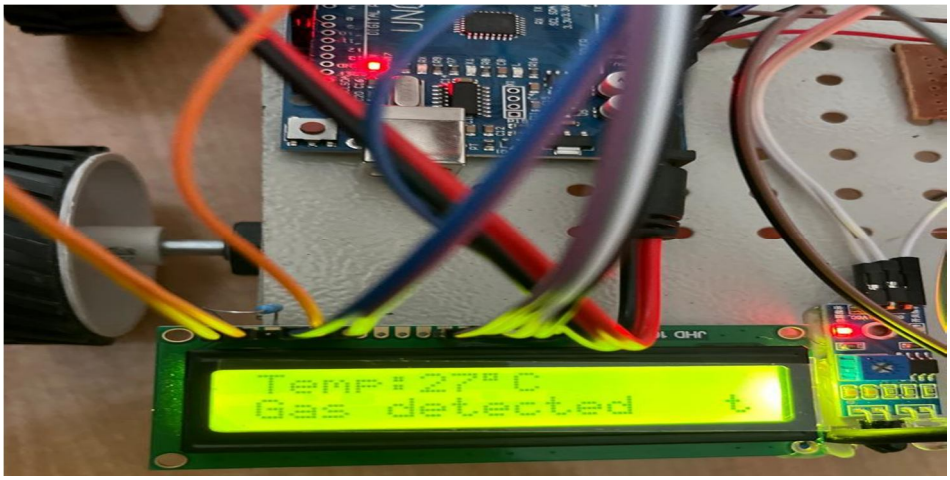

Figure 6 Robot displaying gas detection

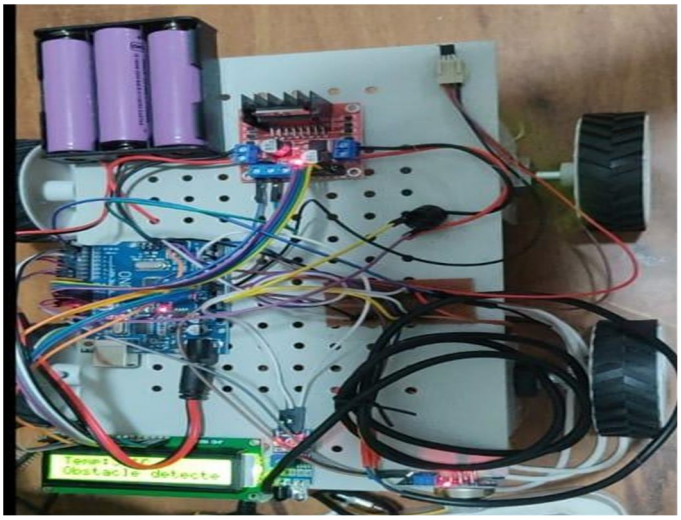

Figure 7 Robot displaying obstacle detection

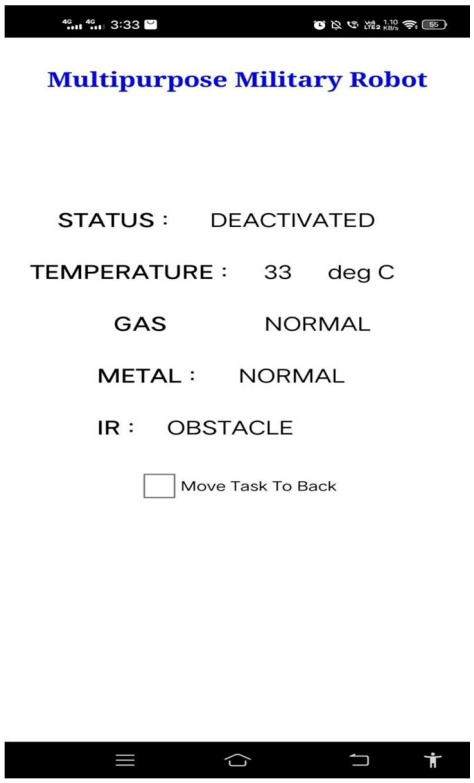

Figure 8 Mobile App displaying Sensor data

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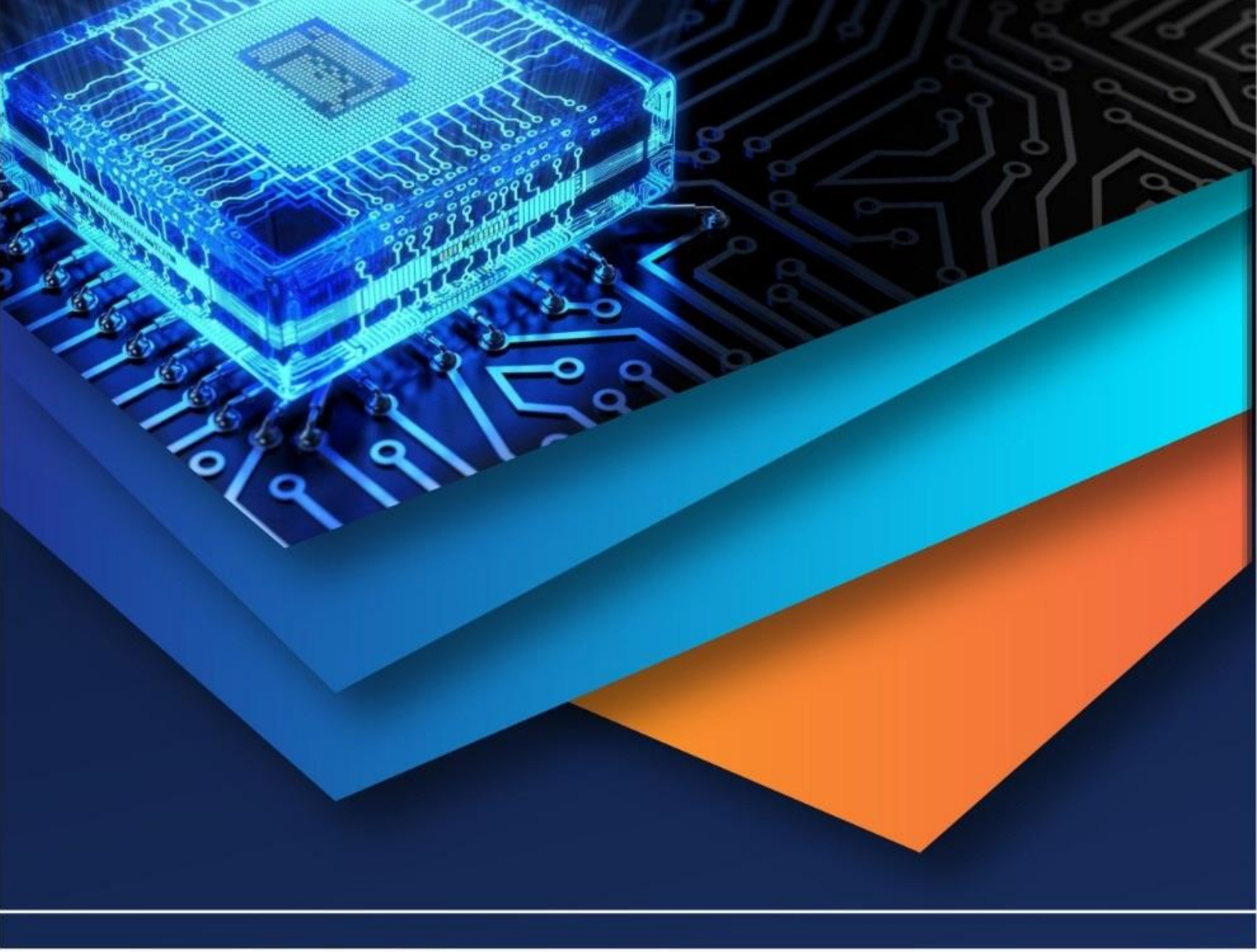

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