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Fire Fighting Robot using IOT

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Abstract: ***Fire accidents are undesirable event which emits heat, smoke or flame. Fire accident can cause a huge number of loss because of the danger and risk involved in rescuing victims out of the fire. In everyday life, it is not possible to always rely on human patrol for detecting and extinguishing fire at a fire accident scene. Fire fighting Robot is very effective in detecting fire accidents in industrial and residential areas where fire possibilities are high. In order to achieve this, this robot is used to detect a flame locate it and extinguishes the fire immediately before it leads to a dangerous accident. In case of risky situations, firefighting robot effectively find the fire and suppresses it. Effective monitoring, fire identification and extinguishing of fire are the problems to be solved. Our project is designed to solve those problems. Fireman can send commands to robot through raspberry pi module which is mounted on robot itself. Sprinkler start sprinkling water when it detects fire using sensor.***
Keywords: Flame, raspberry pi, sprinkler, IoT.

I. INTRODUCTION

Fire accidents are very dangerous that results in human loss as well as property loss. When firefighting units engage in such situations there is a high possibility of losing their lives too. It is not possible for us to monitor industrial and residential areas every second. If an automatic system is there to alert us when something happened, it will be easier for us to control the situation and save lives too. In order to achieve this, we need a system which automatically detects the flame, alert us and helps in suppressing the flames immediately. In case of risky situations, it will be helpful in detecting and suppressing the flame. The automatic robot is designed to avoid further spreading of fire so that lives may be saved. This robot will help fire fighters to do their job effectively. The application of such mobile robots is increasing in our daily life.

Mobile robots are useful in construction sites, warehouses and manufacturing plants. Wireless navigation helps in monitoring the mobile robot. With the help of such robots, fireman's work really decreased and saves lives. At the same time robot can detect any obstacle come in that direction and avoid them by using ultrasonic sensors. Our project is designed to build an application which can control operations of the firefighting robot which can control commands operations of the fire fighting robot. Fireman can send commands to the robot through raspberry pi module which is mounted on robot itself. Fire extinguishing system gets activated when it detects the fire and sprinkler will start sprinkling water when it detects fire.

II.LITERATURE SURVEY

In olden days, when fire accident happened man power is used to suppress the fire which includes risk to the human lives and it takes much time to reduce fire which leads to property loss. There was no such thing as automated fire extinguishing back in the day. The fire department should be dispatched to the fire-prone location, which is run by humans whose life are in risk. Arriving at the fire station takes time, and most fires are put out with water. Later on, as technological advances continue, fire extinguishers containing a fixed amount of Carbon dioxide were developed. In the year 2016, a manually operated fire suppression robot was introduced, followed by pre-trained robots for specific tasks like Smart houses, for example, can detect and avert fires. It also sends a notification to the viewer via Wi-fi, which can communicate over a distance of several meters. [1]. This suggested robot uses the internet of things to transmit live images of the fire-prone region and extinguishes all sorts of fires by equipping it with the appropriate fire extinguishing substances based upon this fire risk zone. [2]A fire extinguisher robot with the appearance and functionality of a robot constructed with the goal of extinguishing a fire using a water pump as operators. The fire extinguisher robot's activities are governed by Android devices connected to WiFi networks through the robot's WiFi module. The robot's microprocessor receives data from the device, which are subsequently converted into mechanical motion. Cameras and infrared sensors were installed in the robots. The camera was used to provide feedback to the user as well as to locate the fire source. The smart phone's screen displays the feedback supplied by the robot's camera. [3] According to Tawfiqur, M. A. Rashid Sarkar The suggested mobile robot includes sensors such as the LM35 and Arduino. Flame sensors are used to determine the characteristics as well as the distances between the sensor and the flames. The Robot's movement is provided by two nylon wheels and a caster ball. Rear-wheel drive cars account for the vast bulk of these vehicles.

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The storage tank may hold a minimum of one litre of water. It's made of a water-repellent substance. A fuzzy logic controller is in charge of the Automobile's object avoidance. The objective of the proposed technique in the study is to guide the Vehicle along its path so that it avoids any static environments with static objects in front of it

III. METHODOLOGY

We move the robot in different directions manually by using Geany software. Flame sensor is used for detection. Once the flame is detected in any direction then camera capture a photo and send it to our mail and automatically motor pumps gets on and sprinkle the water on the fire. If flame is not detected in a direction we move that in other direction.

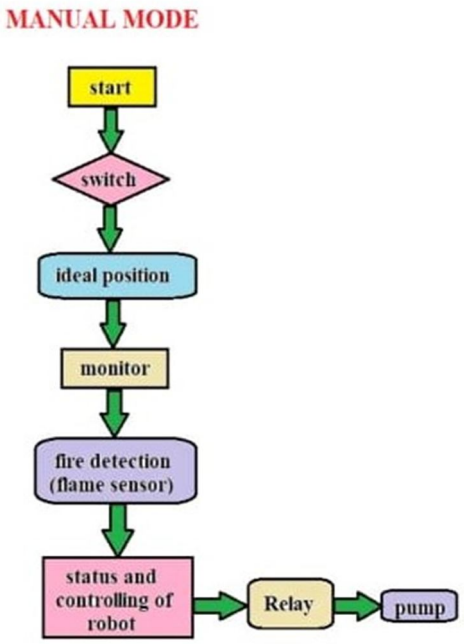

FIG 1: Basic idea

Block diagram is shown in Fig 3.

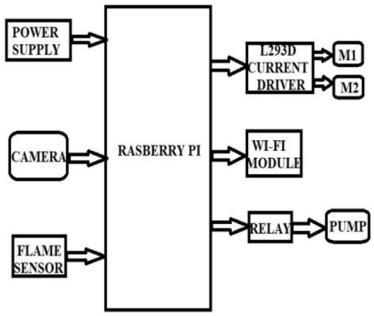

FIG 2: Block Diagram

Here, the Raspberry Pi is the main block with which the other components interact. The power supply is connected to the Raspberry Pi, and both the camera, flame sensor and they will receive power. When a fire is detected, the camera is linked to a Raspberry Pi 3, which sends us an image. The sensor is also connected to the Raspberry Pi through which the Raspberry Pi will get information about whether the fire is present or not. The L293D circuit will connect the motor to the Raspberry Pi. The Raspberry Pi already has a Wi-Fi module built in that connects it to the internet. The relay circuit is connected to the Raspberry Pi and also to the water pump to control the speed of the water pump to get it started.

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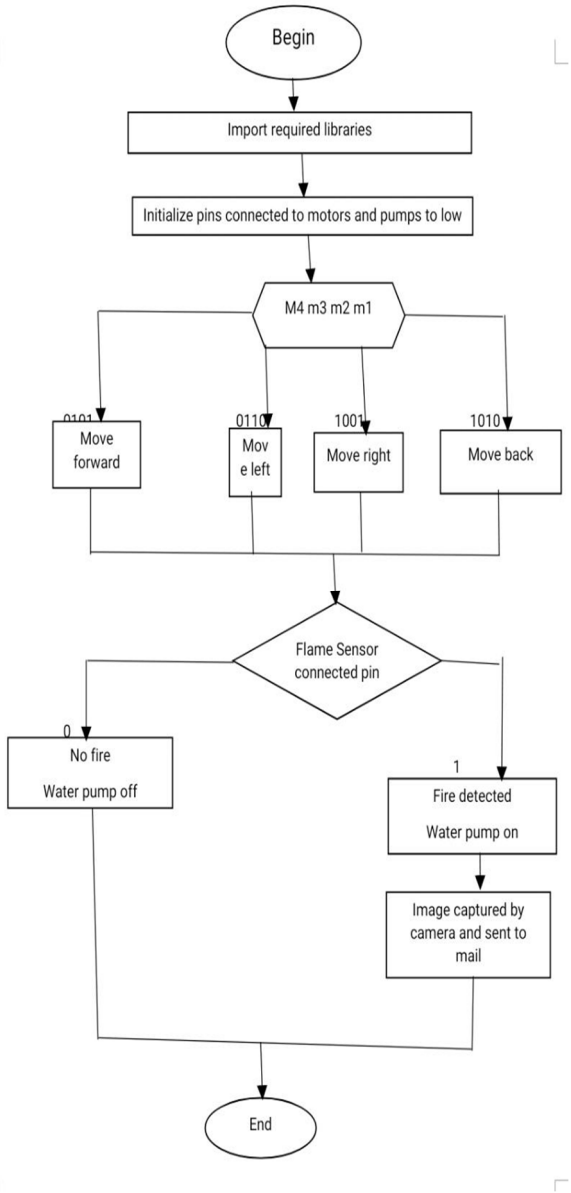
IV. IMPLEMENTATION

The flow chart of the implementation of process is shown below:



To begin, we must connect the Raspberry Pi to the Wi-Fi network. Because the Raspberry Pi does not have a monitor to display, we must connect it to the monitor using an HDMI cable. Next, we must connect a laptop to the Wi-Fi network and enter the password for the respective Wi-Fi network. To get our robot to work, we must first run the code from the Genie programmer's editor. Once the code is running, the flame sensor is used to detect flames and fire, and it sends information about whether or not a fire is currently available. When there is no fire, it appears that the fire pump is turned off. When a fire is detected, the flame sensor sends information that there is a fire or flame present, causing the Raspberry Pi to activate the pump, sprinkle water on the fire, and then turn it off. When the fire is detected, it also sends an image captured by the camera connected to the Raspberry Pi to an email over the internet. The Raspberry Pi is connected to the MATLAB dashboard from which we can operate our robot controls to move front back right left. 2 is responsible for moving the robot. 8 is responsible for moving the robot backward. 4 is in charge of moving it to the left. It is the responsibility of 6 to move it to the right.5 to make the robot constant. When the flame is put off, the robot won't detect any flames and the pump will automatically be turned off.

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V. HARDWARE AND SOFTWARE DESCRIPTION

A. Hardware Components

1) Raspberry pi module

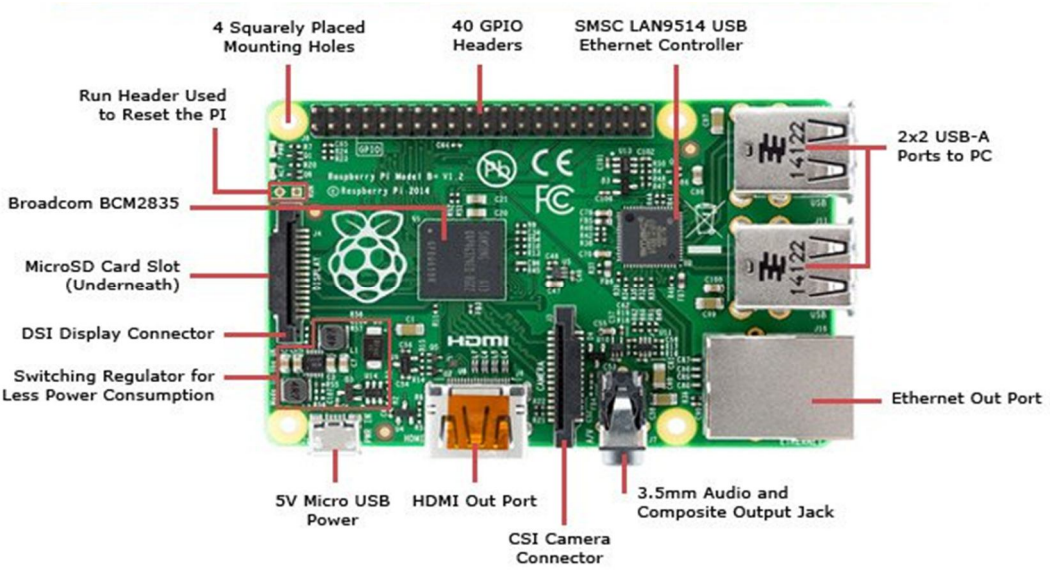

Fig 3: Raspberry pi module

Raspberry pi is a computer board which is used for many tasks that computer does. The main purpose of designing this board is to encourage learning, experimentation and innovation for students. It is a open source platform.

2) Motor driver IC

Fig 4: Motor driver IC

To drive the motor, we are using this motor driving IC L293D. It is a quadruple high-current half- H driver. It is designed to drive inductive loads such as relays, solenoids, dc and bi-polar stepping motors. On the L293D, external high-speed output clamp diodes should be used for inductive transient suppression.

Features:

a) Supply voltage range 4.5V to 36V
b) Separate input logic supply
c) Output current 1A per channel (600mA for L293D)
d) Peak output current 2A per channel (1.2A for L293D)
e) High noise-immunity Inputs.

3) DC Motors

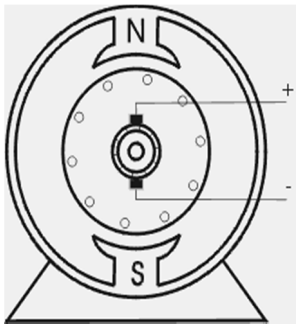

Fig 5: DC motor

Electric motors are used to efficiently convert electrical energy into mechanical energy. Magnetism is the basic working principle of motors. DC motors require direct current/voltage to make them work.

4) Fire Sensor

FIG 6 : Fire sensor

Fire sensor is a simple compact device used for detecting flames. The module uses a IR sensor and comparator to detect flame up to a range.

5) Relay

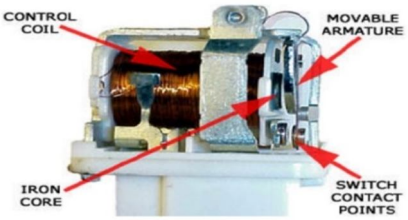

FIG 7: Relay

Relay is a one type of electromagnetic switch. It is used in such cases where low power signal is used.

6) DC Submersible Pump

FIG 8: DC pump

Here for fire extiguising we are using DC submersible pump. It uses direct current electricity as a power source. They doesn't take much space.

B. Software Components

1) Geany

FIG 9: Geany IDE

Geany is GUI text editor which including basic IDE features. Here we are using it for executing the code and for getting output.

VI. RESULT AND ANALYSIS

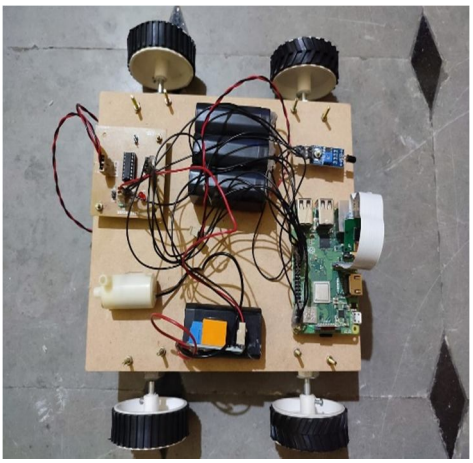

FIG 10: Project Outlook

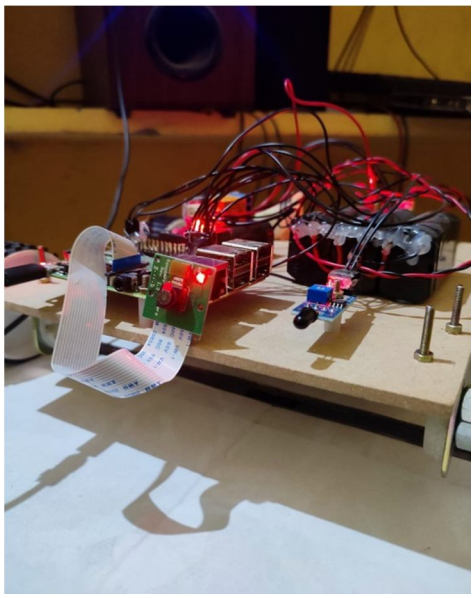

FIG 11 : Result when there is no fire

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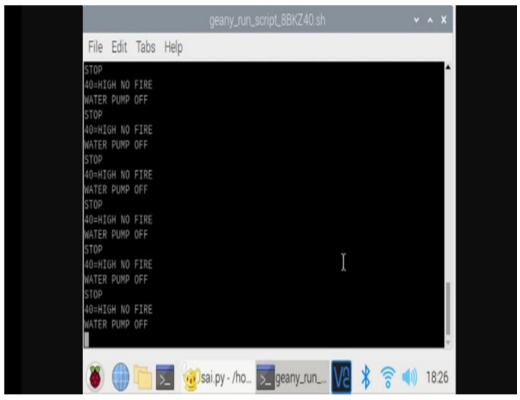

FIG 12: Result when there is no fire

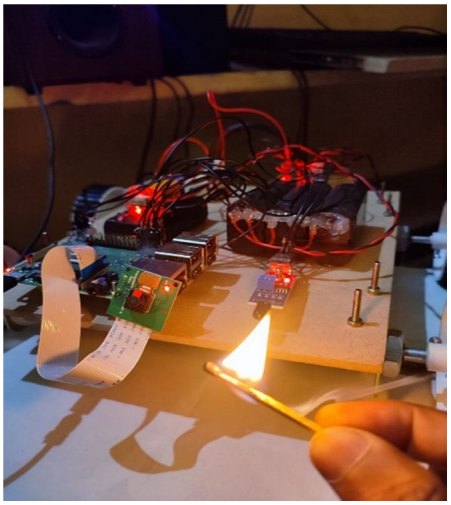
FIG 13: Result when there is a fire

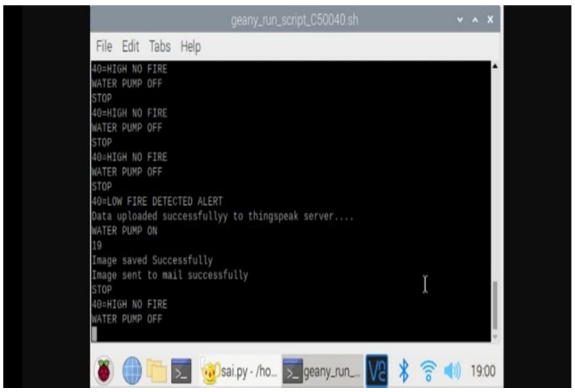

FIG 14: Result when there is a fire

VII. CONCLUSION

We here conclude that this robot is helpful in detecting and extinguishing fire in industrial and residential areas. It captures the flame detected area photo and sends to us. So that we can easily understand about the intensity of the situation.

VIII. FUTURE SCOPE

Here we can add gas sensors to detect the cause of accident and notify it us. So that we can precautions to avoid accidents in future. We can add more fire sensors to detect fire in different locations and send alerts to the owner of that place regarding the accident.

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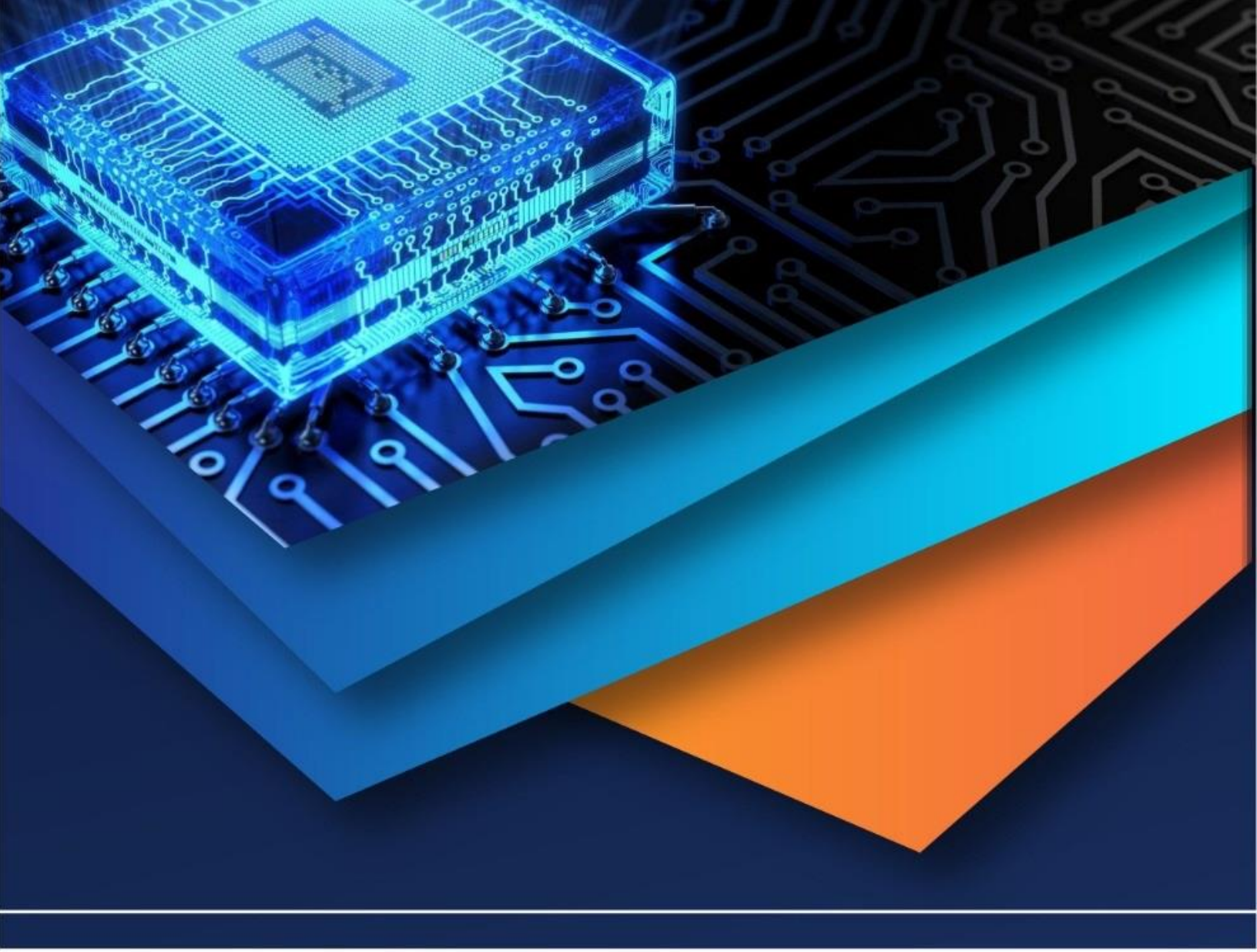

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