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AI and IOT Based Road Accident Detection and Reporting System

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Abstract: ***Road accidents are increasing daily as the number of automobiles rises. An annual global death toll of 1.4 million and an injury toll of 50 million are reported by the World Health Organisation (WHO). The absence of medical assistance at the scene of the accident or the lengthy response time during the rescue effort are the main causes of mortality.***
We can reduce delays in a rescue operation that has the potential to save many lives by using cognitive agent-based collision detection and a smart accident alarm and rescue system. To gather and send accident-related data to the cloud or server, the suggested system consists of a vibration sensor, accelerometer, alcohol sensor, IR sensor, GPS module, camera, and Raspberry Pi. When any accident happens, the module immediately sends accident-related data to the cloud and through the Virtuo 6 application.
Keywords**: *IOT, Sensors, ThingSpeak, Virtuno 6***

I. INTRODUCTION

As the population grows, the need for vehicles is rising tremendously. The percentage of traffic accidents has significantly increased over the past few years. [6][7] Speeding is the primary contributing factor to accidents, according to a recent study. The location of the accident scene is crucial for any rescue operation. If there is a city or a lot of traffic, emergency help will soon be accessible; however, in low-traffic zones or on roads, it is not.
It's challenging to deliver timely emergency relief. Significant injuries are observed to transform into mortality brought on by inadequate medical attention.
Due to the rise in traffic accidents, road safety receives a lot of attention from industries. An intelligent system for accident detection and warning is necessary to reduce the number of deaths from road accidents. Once the system identifies an accident, it will send data to the cloud server (Thing-Speak) and the Virtuno6 application [1].
In our project, we suggest a vibration sensor and an accelerometer for accident detection. Camera, Raspberry Pi, GPS module, and IR sensor to gather and send accident-related data to the cloud or server. [1], [2], [3].The suggested system comprises two stages:

1) Using IOT, an accident is discovered in the first phase.
2) The second phase involves sending accident data to the cloud and to the Virtuno 6 application.

II. LITERATURE REVIEW

The purpose of this literature review is to examine previous research, emphasise leading research studies, identify trends, and establish a theoretical framework. For the development of an accident detection and reporting system. We conducted a systematic literature review (SLR) study to investigate the development of research on accident detection and also on reporting systems. The SLR approach is done by searching, collecting, and analysing scientific literature that aims to answer the research questions that have been determined [1]. T
here are many searches done regarding accident detection and reporting systems. Those studies deliver many contexts of accident detection and its reporting to the emergency department, such as methods, its development, features, and technologies [2], [3], [4], [5], [11].

III. WORKING OF ACCIDENT DETECTION AND REPORTING SYSTEM

The accident detection and reporting system work in the following way:

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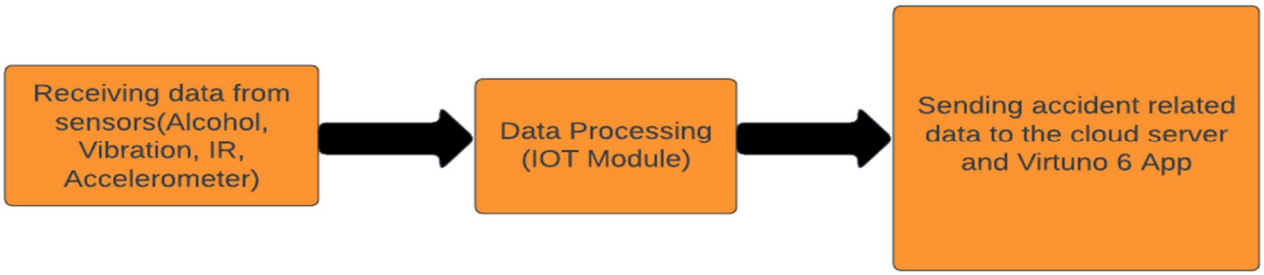


Fig.1 Working of Accident Detection and Reporting System

Proposed Architecture:

To address current issues with the ADRS (Accident Detection and Reporting System), this study offers an integrated accident detection and reporting system (ADRS). We employ an IoT There are two phases to the proposed ADRS. IoT is used in the first phase to detect accidents and send data about the accidents to the cloud server and Virtuno 6 in the second phase. Below, Fig. 2 illustrates the architecture of the proposed system. [1][2]

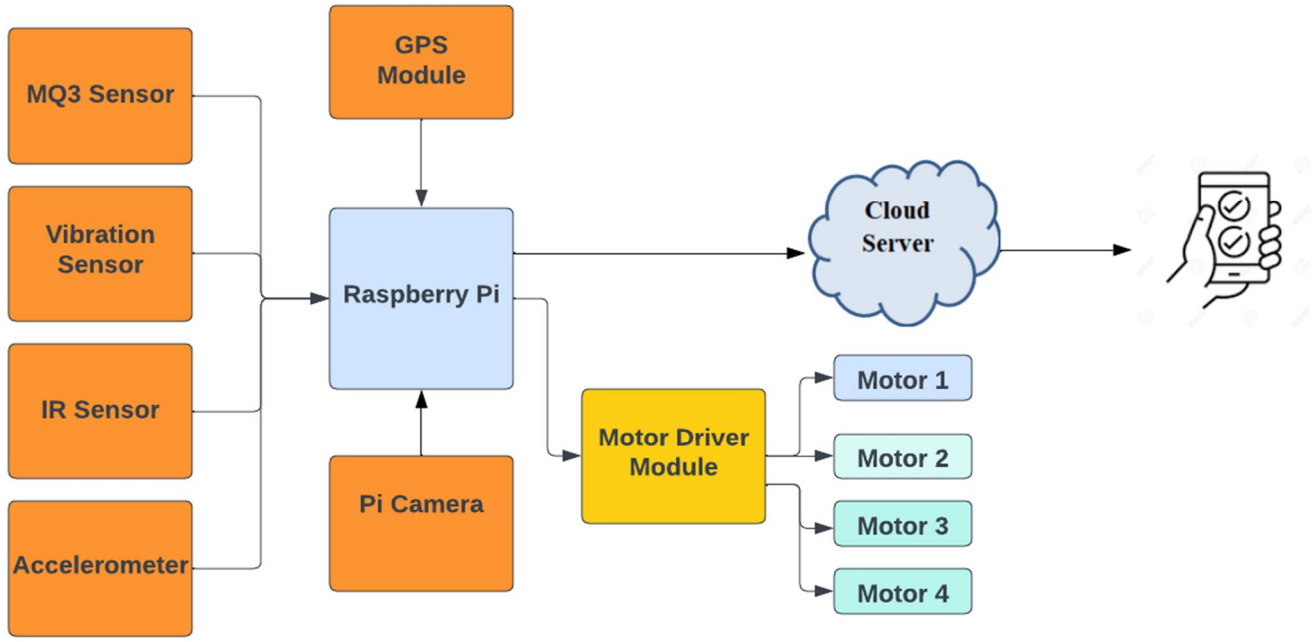


Fig.2 Proposed Architecture of Accident Detection and Reporting System

IV. DETAILS OF PROPOSED ACCIDENT DETECTION AND REPORTING SYSTEM

Working of proposed system is take place in two main parts:

1) Accident detection

2) Sending accident related information to the cloud server (Thing Speak) and on Virtuno 6 Application

a) Accident Detection

IoT and AI capabilities are used in this module to identify accidents and gauge their severity. Different sensors are used to identify accidents and gather accident-related data like location, vibration, etc. The details of the IoT module are as follows:

IoT Module:

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The primary function of this module, which serves as the core of the proposed ADRS, is accident detection. It makes use of many sensors and IoT gadgets. A detailed description of various sensors and other components is given below:

- Vibration Sensor: It serves as the foundation of the ADRS. In order to convert applied mechanical forces, such as tensile and compressive forces, into output signals whose value may be employed to indicate the force's intensity[1]
- Accelerometer: This helps us to measure acceleration, velocity, orientation, displacement and many other motion-related parameters of a system or object.
- Raspberry Pi: The Raspberry is a little computer system with an operating system that can complete all tasks that a desktop or laptop can. It is a capable controller that links IoT devices.
- Pi Camera: The Raspberry Pi is connected to the Pi camera, which is mounted on car. When an accident is identified, the video and photos are taken and storing them.
- GPS: It supports the rescue effort and communicates with the Raspberry Pi. and is used to determine the accident location.[1-4]

b) Sending Accident Related Information To The Cloud Server (Thing Speak) And Virtuno 6 Application

In the end after all the controlling and processing is done raspberry pi sends data to cloud server which is things speak server. Along with cloud server update is given on mobile application also which is our reporting system.

V. FLOWCHART

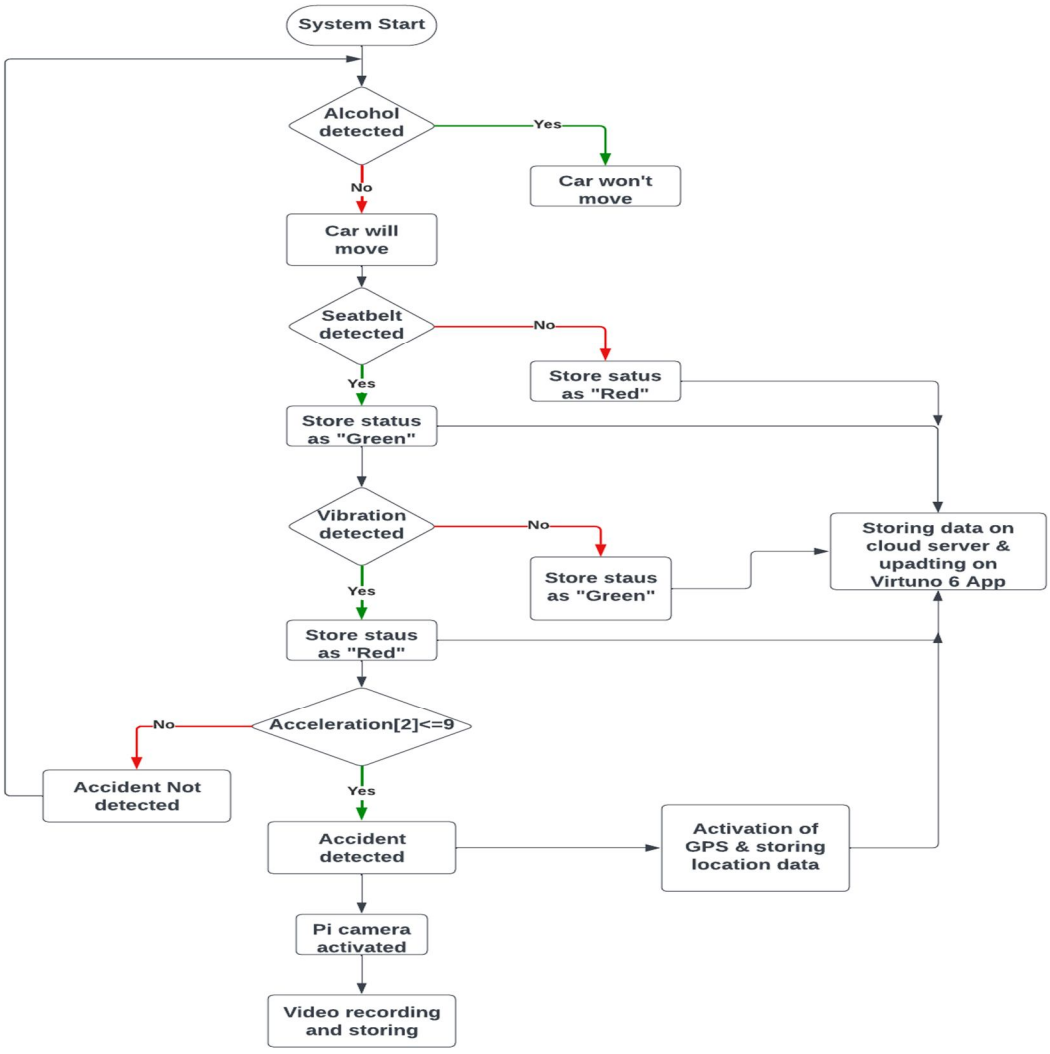


Fig.3 Flowchart of the proposed Accident Detection and Reporting System (ADRS)

VI. EXPERIMENTAL SETUP

The accident detection and rescue system and ADRS are two separate modules. We attached a built-in IoT kit to the toy car because the suggested ADRS' effectiveness cannot be assessed in the actual vehicle. The car is mounted with every component, including the sensors, alarm, controller, etc. The GPS module is used to determine the accident location. The configuration of numerous pieces of equipment in the car is shown in Figure 4.

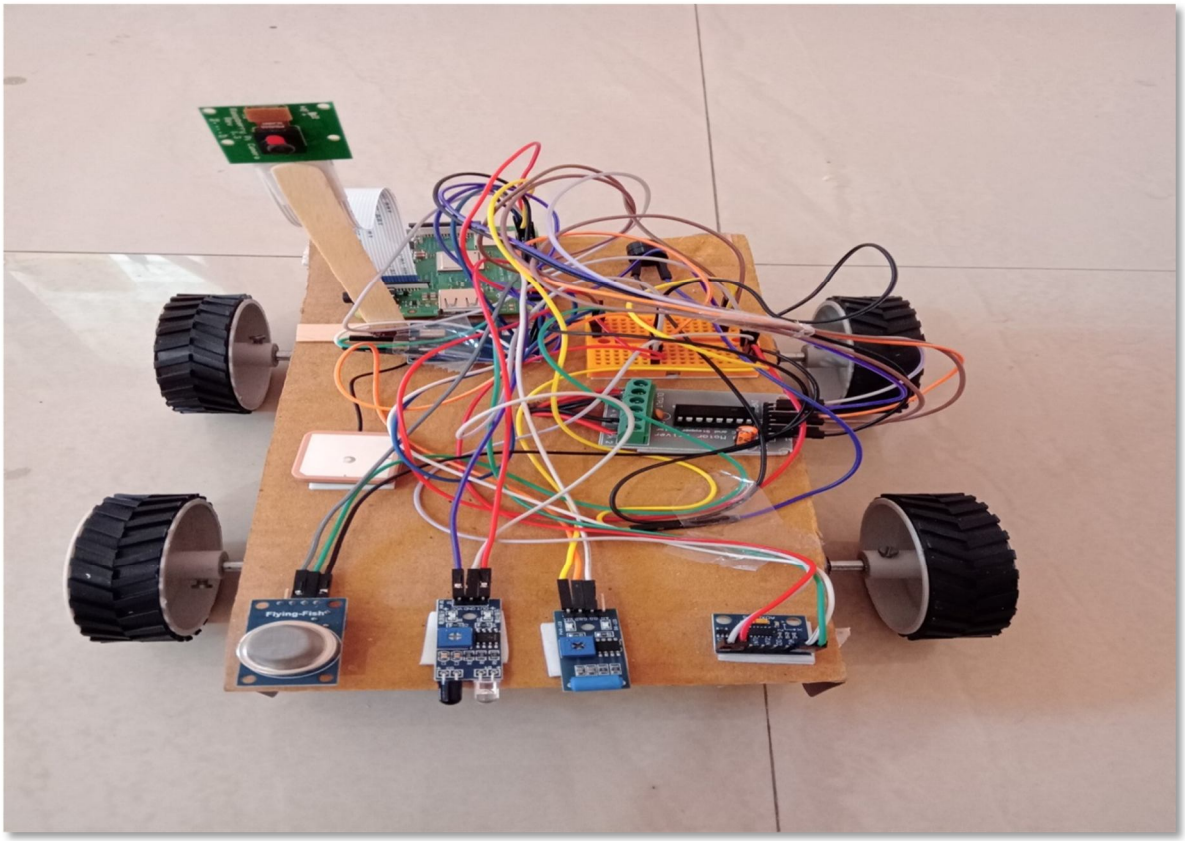
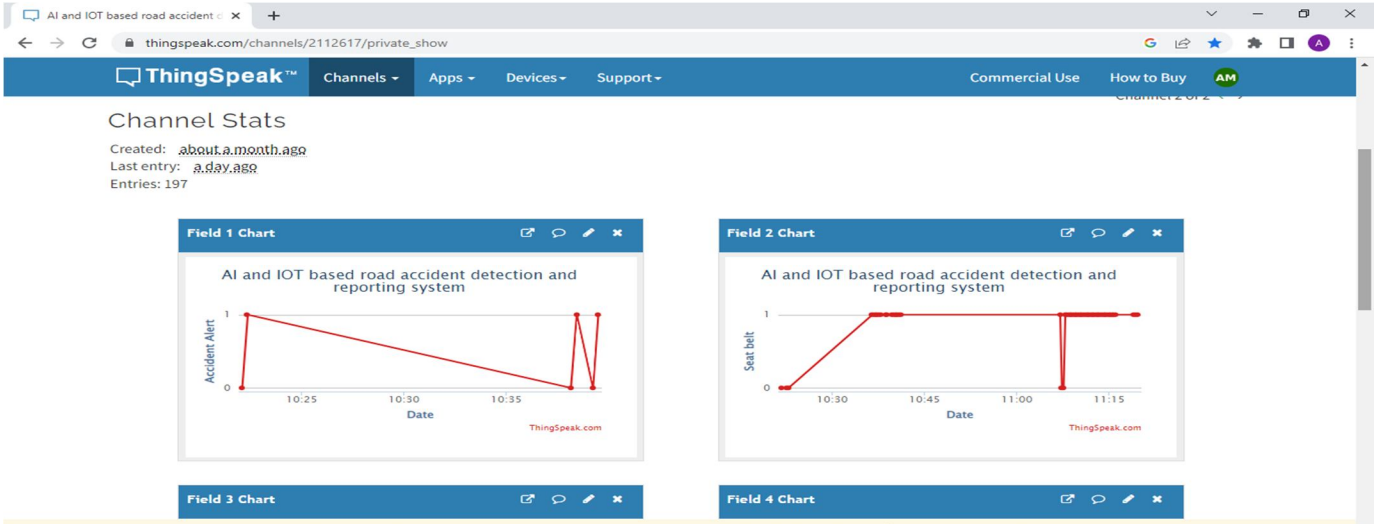


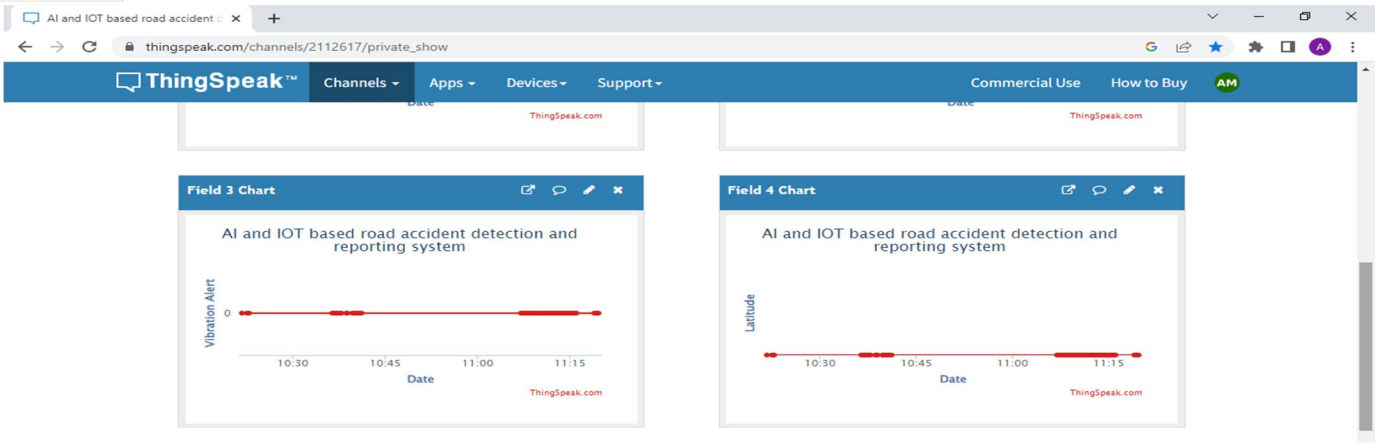
Fig.4 Installation of a developed IoT kit on a car (Complete system hardware)

VII. EXPERIMENTAL RESULTS

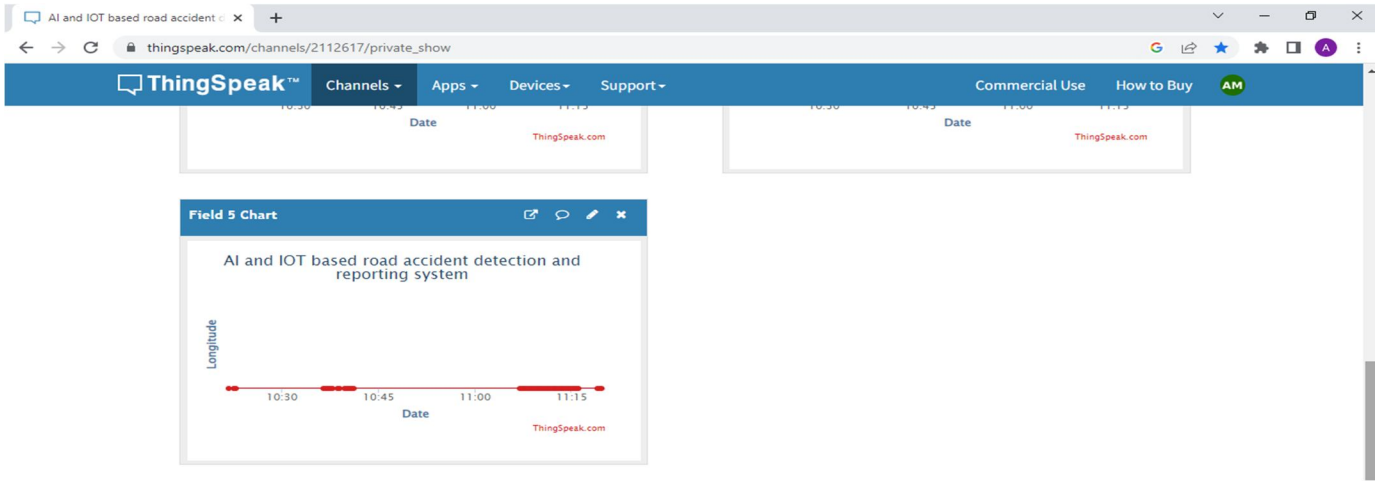
A. *Cloud server (Thing Speak) Results*



(a)



(b)



(c)

Fig.5 (a) Accident Prediction and Seatbelt update (b) Vibration and, (c) GPS Parameter

B. Virtuno 6 Application Result

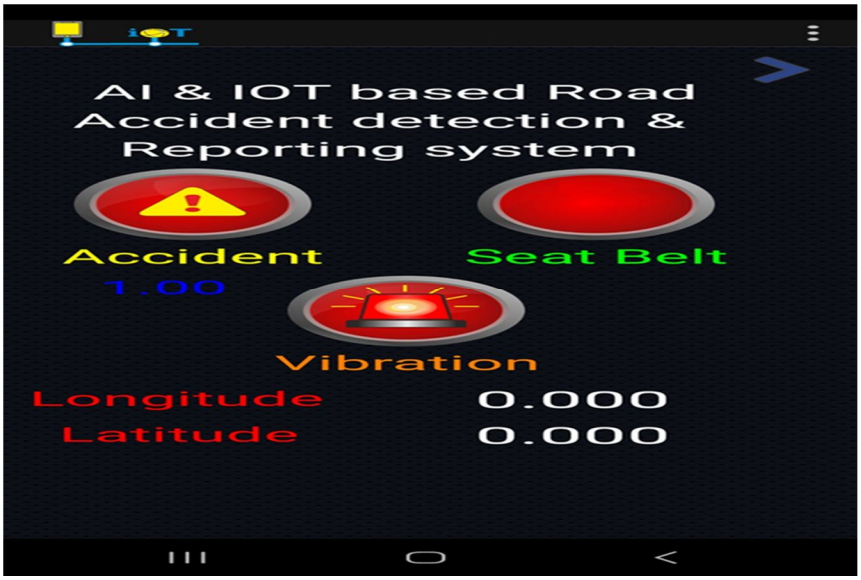


Fig.6 Virtuno 6 Application Interface

VIII. CONCLUSION

This proposed system of "AI and IoT-based road accident detection and reporting systems" has been found to be extremely useful in accident detection. In this model, we receive data from the sensors, and all that data is collected so that it can be sent to a cloud server named as things speak. Also, accident-related information is updated on the application, i.e., Virtuino 6.

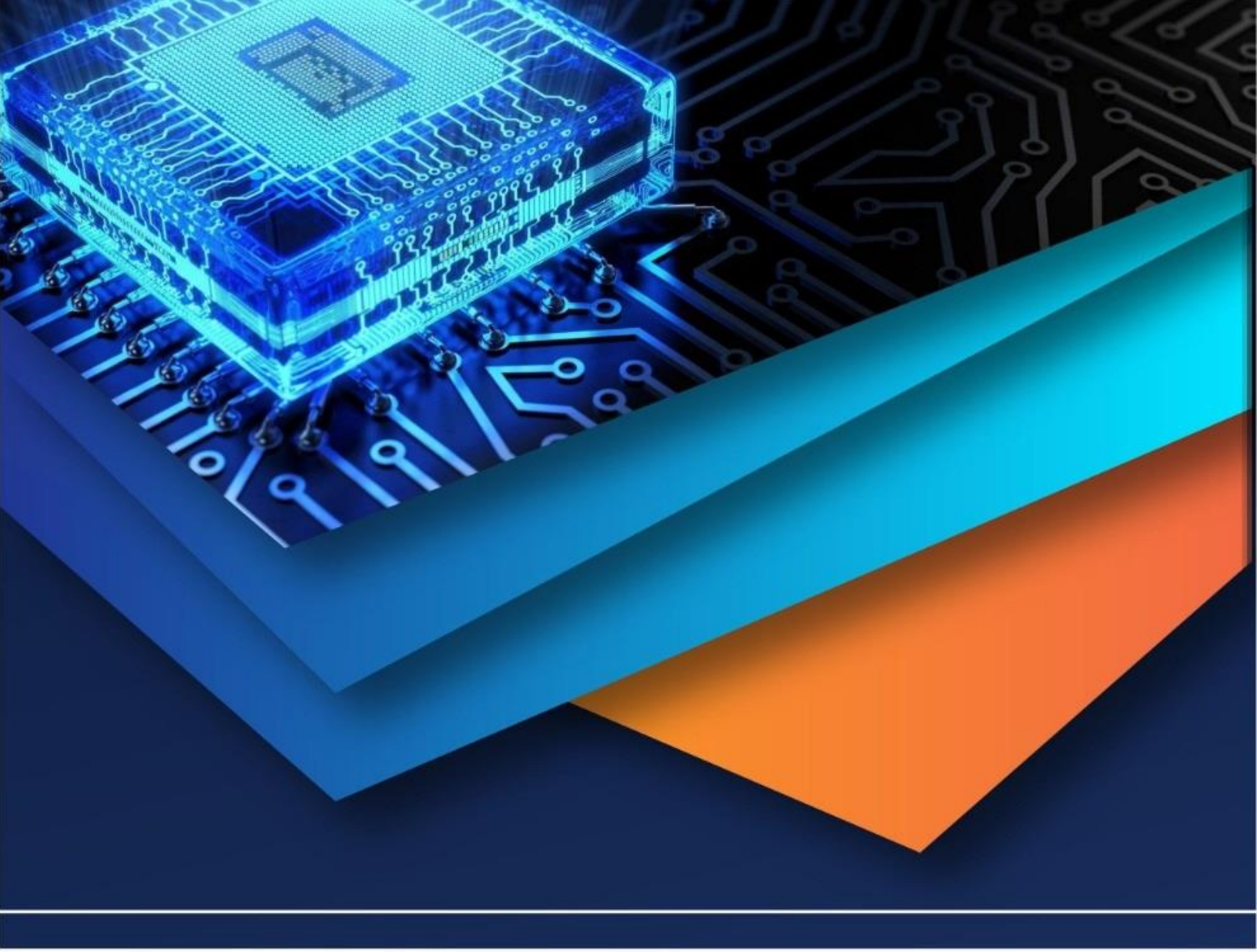
This module is an effective way to prevent accidents by alerting drivers about potential hazards, such as alcohol consumption and smoke in the vehicle. Additionally, it can detect accidents in real-time and is also capable of capturing video of the accident site, providing timely medical assistance to the injured by sending accident data to a cloud server and thereby informing a specified person. In this system, accident reporting is done via Raspberry Pi to the cloud server, and if there is an accident, we send an alert to the application we are going to provide in this module. If this system is mounted on a vehicle, it can reduce accidents. It may also be helpful in reducing accidental deaths caused by a lack of timely assistance from medical services or any other emergency services. This system is cost-efficient and reliable.

As with any system, there will be some drawbacks. The system is only able to record videos of the accident site and store them in the vehicle system. It is not possible to send it to emergency services, mostly police stations. This system can only report whether an accident happened or not. But it fails to analyse video recorded after an accident. So if an accident happened, then police need to check the vehicle database to get accident video recorded immediately after the accident happened.

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