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Bus Tracking System Using RF Communication for Passenger Information over Internet of Things

Bagam Nagaraju [1], Thungapally Akhila [2], Shashank Valasa [3], Dr. Abhishek Choubey[4]
[1, 2, 3]*Students,* [4]*Internal Guide, Associate Professor of Department of Electronics and Communication Engineering, SNIST, Hyderabad, India.*

Abstract: ***Now-a-days in every bus stations, railway stations, and airports we will get different voice based announcements are given by the authorized transport people in different languages to help public for ease of transportation. The announcements consist's of some delay's, occurrence of bus at particular bus station/stop and platform. This project aims for designing a system which is capable of updating the information about the bus location and accident detection of bus. This device is designed to provide with a good advantage of producing the updated information which is available through internet using GSM Communication. This is possible with the help of RF Communication and GSM Communication. RF Transmitter is given with four switches is pressed (i.e) RF Receiver gets particular frequency then the controller will understand the location and updates the same thing about bus location using GSM module connected to the Arduino Uno controller. Here we are using AT89C51 as our micro-controller in RF Receiver kit. This Project uses regulated 5V/500mA power supply 7805 and 7812 are three terminal voltage regulators is used for voltage regulation. A Bridge type full wave rectifier is used to rectify the ac output of another 230/12V step down transformer.***

Keywords: RF Communication, RF Transmitter, RF Receiver, AT89S51 microcontroller, SIM800A GSM Module, etc.

I. INTRODUCTION

Now-a-days world's population is being increased rapidly day by day, by the rapid increasing of the population the fellow citizens need to survive for their livelihood. So, each and every citizen will travel from one place to another by means of various transportation like Roadways, Airways, Waterways, etc for their need of work. Initially the vehicle tracking system was first started for the shipping industry like delivering the respective goods from one location to another location, because the people wanted to know where each vehicle was at any given time. Now-a-days, however with the technology growing fast day-by-day rapidly, and this automated vehicle tracking system is being used in a variety kind of ways to track and display the current location of the vehicle/bus to the passengers for ease of transportation. However, the present bus transport system has very poor transportation information system nowadays. Passengers do not know the exact arrival or departure time of particular bus, but the people only know's the scheduled approximate bus arrival time which will vary with some practical terms like bus traffic, bus breakdown etc. Bus transportation system is also not able to provide the exact location of the buses position in each and every bus stops.

In order to overcome this problems and enhance present bus transportation system we need to design and implement the real time bus tracking system which provides the passengers and citizens the information regarding the bus current location where it is located at present and in this system we can also provide information regarding any kind of accidents occurred to the particular bus, it will send an alert to the concern bus transportation department, medical department, ambulance etc. for immediate action of saving lives and can be prevent further accidents.

This whole system will provide information to passengers in two methods regarding the bus location by using RF Communication and GSM Communication. The main technology used in this system is Global Positioning System (GPS). GPS receives the exact position of the object from space based navigation system through GPS receiver. As by using the wireless data transmission using GSM technology in the form of SMS we will able to get the exact location of the bus by getting the Google map link via text SMS with so an so bus number to the respective user/passenger.

II. EXISTING METHODOLOGY

At present, public transportation plays a key role in everyone's life for budget friendly transportation from one location to another location. So, nowadays we are utilizing the public transportation like bus, train, auto etc for our easy way of transportation and we are not aware of the bus in which at what time the bus will arrive and departs from the bus station, we don't have the information regarding bus location.

So, the passengers travelling in the public transport with lack of bus information in terms of bus location, passenger count inside the bus etc. Recently we all aware of bus accidents which occurs with any reasons and lost many precious life's. We don't have any information system regarding of getting an alert of any bus met with an accident.

III. HARDWARE AND SOFTWARE REQUIREMENTS

A. Hardware Components

1) Arduino UNO
2) 16x2 LCD display
3) AT89C51 micro-controller
4) SIM800A GSM Module
5) Ublox Neo-6M GPS Module
6) RF Transmitter
7) RF Receiver
8) Limit switch.

B. Software Components

1) Arduino IDE platform.
2) Keil uVision 4

IV. BLOCK DIAGRAM & CIRCUIT DIAGRAM

1) Bus Driver Transmitter Block Diagram

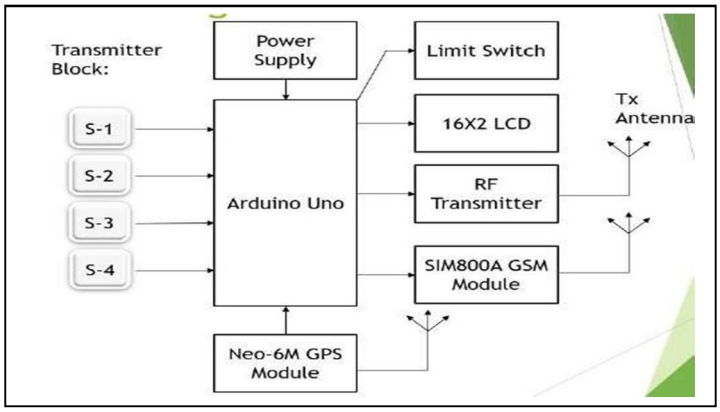

Fig. 1: Transmitter Block Diagram

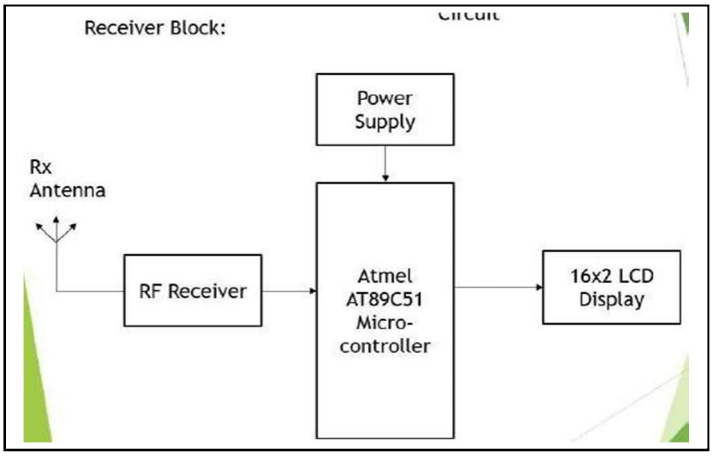

Fig. 2: Receiver Block Diagram

V. PROPOSED METHODOLOGY

The bus tracking system will provide information of the bus location to the remote user or passengers out there. This system mainly gives the information of the bus in two methods respectively. We are using two types of communications between bus driver to passengers & bus driver to the transport department.

The first method is that we are informing the fellow passengers about the particular bus location via RF Communication based sending data to the passengers waiting over at bus station. In this method, we are using two models as one is RF Transmitter block (Bus Driver kit) & another one is RF Receiver Block (Bus Station kit) in which it contains of four switches, Arduino Uno, GPS Module, GSM Module, 16x2 LCD Display in RF Transmitter block and AT89C51 Micro-controller unit in RF Receiver Block. The bus driver need to manually press the each switch which represents the bus stops of the particular bus route and sends the data to the LCD Display which is monitored in the bus station by waiting passengers. The displayed data will be as "BUS TS1234 IS AT LOCATION: xxxxx" in the bus station block. Similarly the bus driver need to press all the other respective switches after crossing the each bus stop in that bus route to send the bus location to the passengers waiting over at bus station.

In second method, this is used for getting the accurate bus location to the passengers effectively by GPS & GSM Communication in between bus driver and passengers in the metropolitan city or the passengers waiting out of the bus station. The passengers will able to track the real time bus location by using GSM technology by sending an SMS to the concerned mobile number sim which is inserted in the GSM Module in RF Tx block. After that any remote user wants the information of the particular bus location from anywhere in the city, the user is all need to do is sending an text message to the mobile number in the GSM Module as "@9234564563" then the GSM Module receives the message and Arduino checks for the GPS availability and sends a command to the GPS Module to receive the location of the bus from the satellites and then it sends the latitude & longitude co-ordinates to LCD Display in RF Tx block and it also send a SMS containing the google map link as "ALERT, BUS.NO.TS1234 IS AT LOCATION: https://www.google.co.in/maps/place/(latitude,langitude". By this method any remote user in the city will get access to the bus location in a very easy manner by sending a single message.

It also gives information regarding any accident occurred to the bus at anytime to the concerned transport in-charge and to the transport department. It is basically works with the principle of limit switch which will be present in the bus driver circuit and whenever the accident occurred the limit switch will get pressed by the obstacle in which it indicates accident occurred to particular bus. Then Arduino sends the command to the GSM Module and it sends the accident prone area location as "ALERT, ACCIDENT DETECTED FOR BUS NO.TS1234, AT LOCATION: https://www.google.co.in/maps/place/(latitude,langitude" to the concerned transport department, Hospitals, Ambulance and Police Department.

Through this system we are able to get the information of bus in terms of bus location to the public and accident detection of bus to the concerned departments in two types of Communication which is RF Communication and GPS,GSM Communication.

VI. ADVANTAGES

1) GPS TRACKING helps you know where your vehicles and asset are and how long they have been at a particular location
2) This especially helpful for oil & gas companies.
3) GPS is also used to track anyone suspicious person.
4) It also plays a key role in cab services (OLA, UBER, RAPIDO,..etc) for getting directions of the destination.

VII. DISADVANTAGES

1) Signal jamming.
2) Power dependency.
3) Privacy and cost.
4) Privacy issues and crime.
5) Driving distractions.
6) Lack of local knowledge.

VIII. APPLICATIONS

1) This system provides bus information to the concern department for daily progress and evaluation.
2) This is also can be used for tracking the most essential goods for the production of a company.
3) Bus tracking system also provides the alert information to the production.

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IX. RESULTS & DISCUSSION

1) *Method-1:* Getting Bus Location Information Using RF Communication

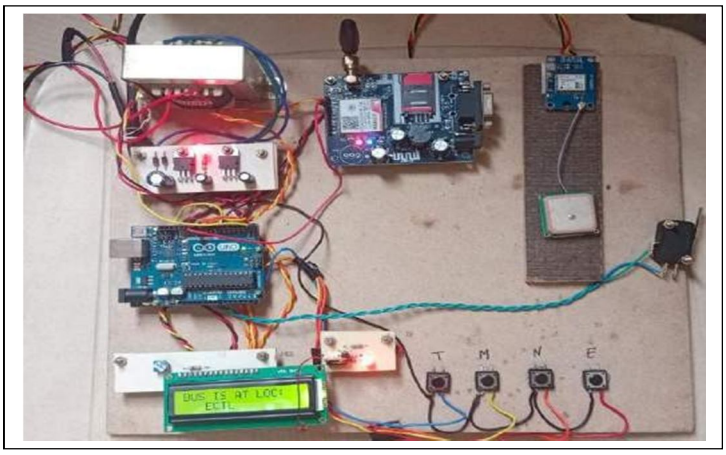

Figure 3 Bus Driver Transmitter Kit

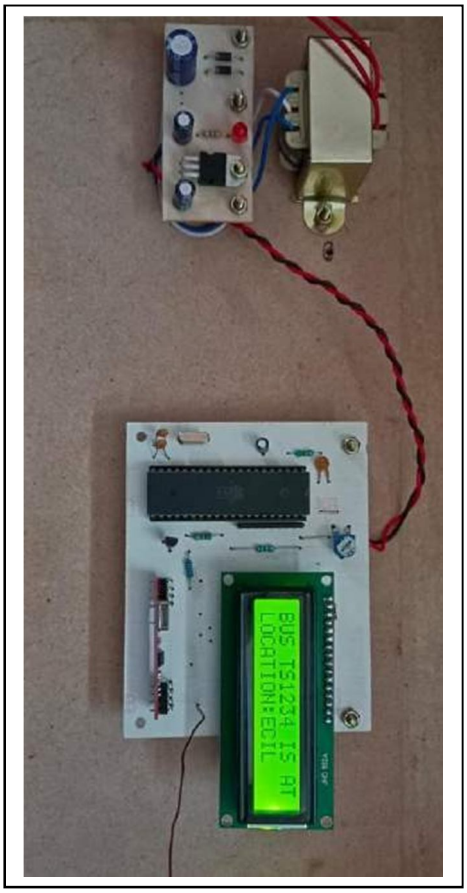

Figure 4 Bus Station Receiver Kit

Above figures shows the current location of the bus by pressing the push keys on the bus driver kit(Tx) which shows the bus location in the bus station kit(Rx).

2) *Method-2:* Getting Bus Location Using GPS & GSM Communication

MESSAGE:@MOBILENUMBER@

Figure 5 Sender Message Format

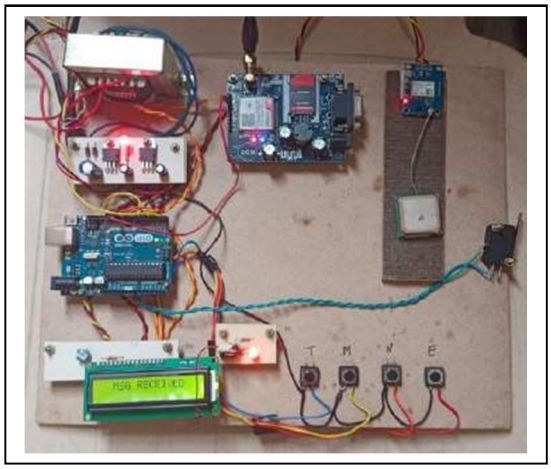

Figure 6 MSG Received to BUS GSM

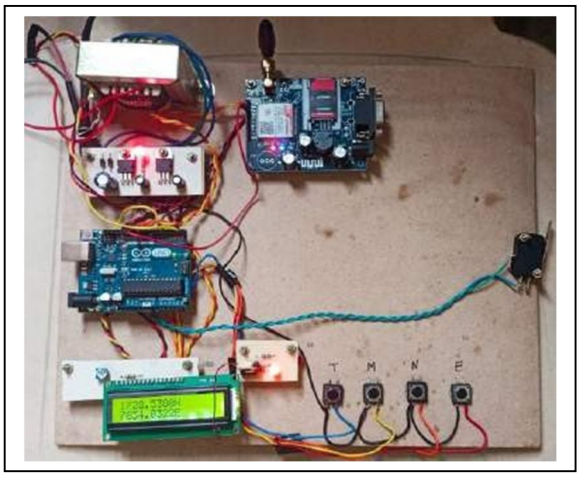

Figure 7 Sending Location data to people

Figure 8 Screenshot of Received SMS from the bus driver GSM Module with Google Map Link

3) *Method-3:* Accident Detection Of Bus & Sending location to the Departments

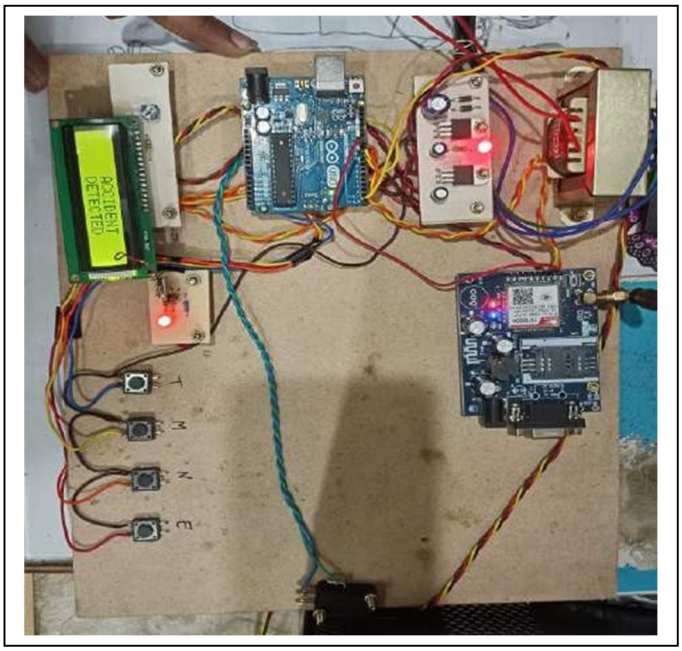

Figure 9 Accident detected to the bus.

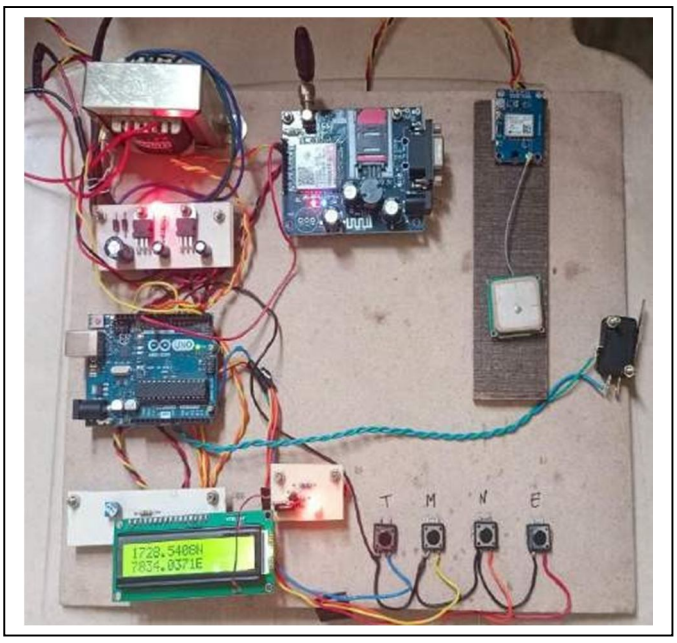

Figure 10 Sending accident location to Dept

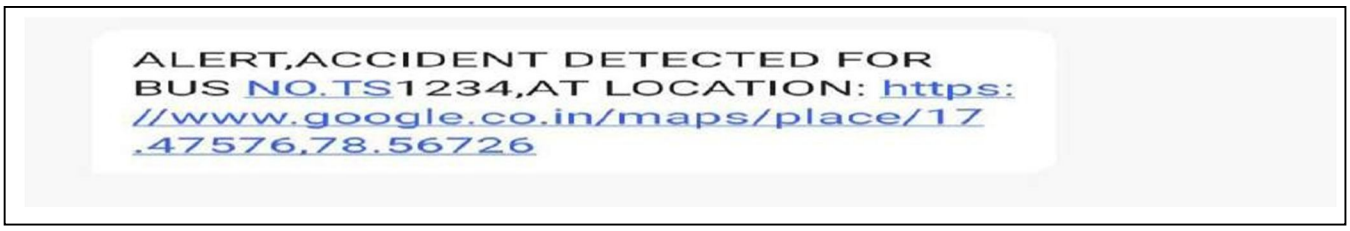

Figure 11 Screenshot of Received SMS of bus accident location from the bus driver GSM Module with Google Map Link

X. CONCLUSIONS

Bus Tracking system is mainly used for providing information of bus in large cities for better and ease of transportation. It is completely integrated so that once it is implemented in all buses, then it is possible to track anytime from anywhere.

It has real-time capability, emerges in order to strengthen the relations among people, vehicle and road by putting modern information technologies together and able to forms a real time accurate, effective comprehensive transportation system.

This is really a great project and can be implemented in every buses for a better public transportation.

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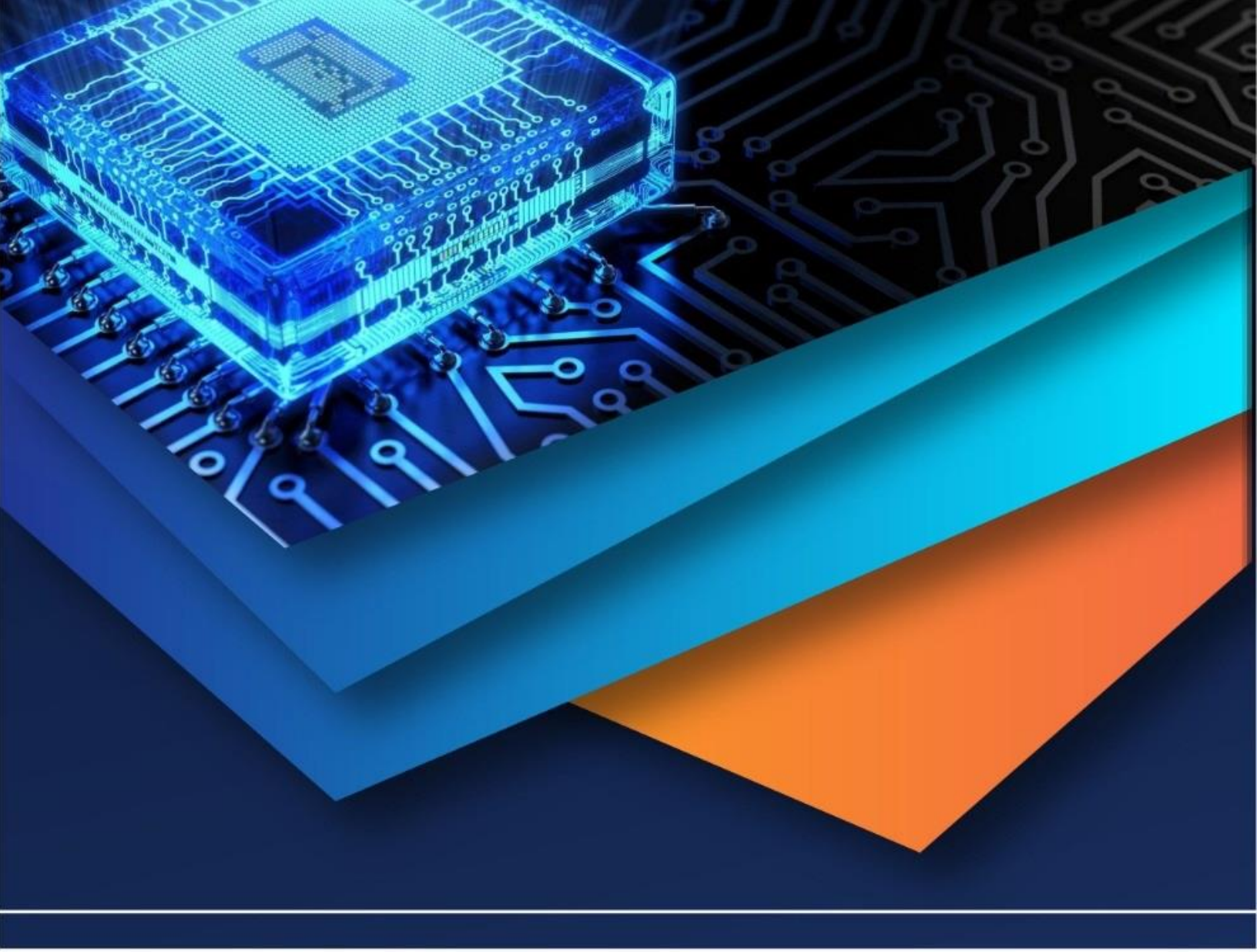

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