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Automated control for Two Way Vehicle to Vehicle Communication Using IoT

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Abstract –

This paper proposes an automated control system for facilitating Two Way Vehicle to Vehicle (V2V) communication using IoT technology. With the rapid advancement of autonomous vehicles and smart transportation systems, effective communication between vehicles has become crucial for ensuring safety, efficiency, and traffic management. Traditional methods of V2V communication often rely on predefined protocols and manual interventions, leading to limitations in adaptability and scalability.

In this study, we present a novel approach leveraging IoT devices installed in vehicles to enable seamless and dynamic communication between vehicles on the road. The proposed system utilizes a combination of sensors, actuators, and communication modules integrated into vehicles, allowing them to exchange real-time data such as location, speed, direction, and the status of the vehicle. Through intelligent algorithms, the system can analyze incoming data streams, identify potential hazards or traffic conditions, and autonomously make decisions to optimize vehicle movements and enhance overall traffic flow and increase the intelligence of the autonomous vehicles.

Key Words **,Internet of things(IOT), vehicle to vehicle (V2V)**

1.INTRODUCTION

This project focuses on implementing a Vehicle-to-Vehicle (V2V) communication system using Internet of Things (IoT) technology. The objective is to enhance road safety and efficiency by enabling real-time data exchange between vehicles. Utilizing sensors and communication modules, the system facilitates the sharing of information such as speed, location, and road conditions among nearby vehicles. The collected data is processed centrally, allowing for the generation of alerts and warnings to improve driver awareness and preemptively address potential hazards. This V2V communication framework aims to create a connected and responsive automotive ecosystem, contributing to safer and more intelligent transportation network. Using two-way vehicle-to-vehicle (2WV2V) communication, a vehicle can detect the position and movement of other vehicles up to a quarter of a kilometer away. In a real world where vehicles are equipped with a simple antenna, a computer chip and GPS (Global Positioning System) Technology, your vehicle will know where the other vehicles are, additionally other vehicles will Know where you are too whether it is in blind spots, stopped ahead on the highway but hidden from view, around a blind corner or blocked by other vehicles. The vehicles can anticipate and react to changing driving situations and then instantly warn the drivers with emergency warning messages. If the driver doesn't respond to the alerts message, the vehicle can bring itself to a safe stop, avoiding a collision.

1.1 PROBLEM STATEMENT

The existing road infrastructure faces challenges related to road safety, traffic congestion, and timely communication between vehicles. Lack of real-time data exchange among vehicles hinders the ability to proactively address potential hazards and optimize traffic flow. This project addresses these issues by implementing a Vehicle-to-Vehicle (V2V) communication system using Internet of Things (IoT) technology. The aim is to overcome the current limitations in inter-vehicle communication, fostering a safer and more efficient transportation environment. By developing a robust V2V framework, the project seeks to mitigate accidents, reduce traffic congestion, and enhance overall road safety through improved communication and collaboration among vehicles.

Fig 1.1.1 shows, A driver should constantly keep an eye on vehicles closest to her/his location in order to avoid collisions. Unfortunately, the driver often does not see closest vehicles due to obstacles (other vehicles, trees, buildings, etc.). In this paper, we introduce a novel type of query called a continuous range k□nearest neighbor (CRNN) query in vehicular ad-hoc networks, and propose a scheme for query processing. The main objective of this processing is to avoid the collision between the two vehicles when the driver should not able to control the vehicle. i.e. When driver should get disable to control the vehicle then this system should provide the proper response to the system for collision avoidance. The aim of our project is to avoid the collision between two or more vehicles on road for the safety purpose using this system. Following objectives can be achieved through this proposed work.

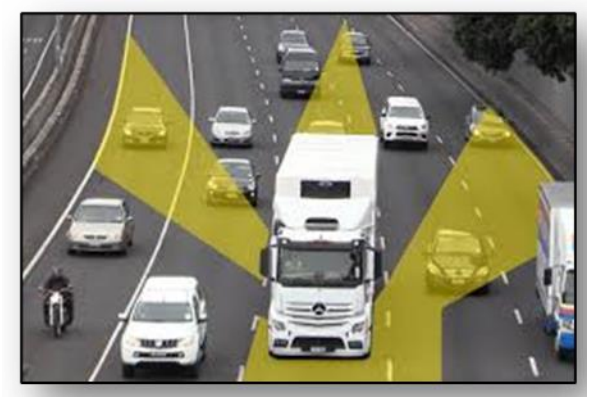


Fig 1.1.1

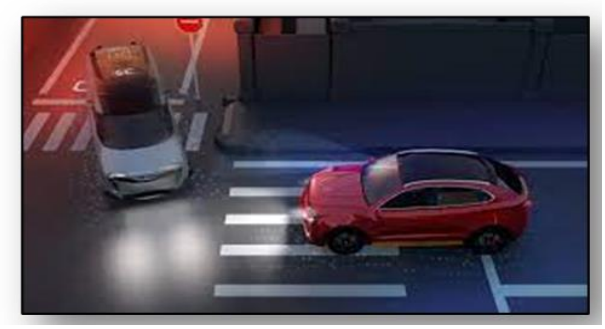


Fig 1.1.2

2. OBJECTIVES

The main objectives of Vehicle-to-Vehicle (V2V) communication are aimed at enhancing road safety, improving traffic efficiency, and contributing to the overall advancement of transportation systems. Here are the key objectives of V2V communication:

I. Improve road safety by enabling vehicles to exchange information about their speed, position, and direction, allowing for real-time warnings and collision avoidance maneuvers.

II. Minimize the number and severity of traffic accidents through early detection and warning systems that alert drivers to potential dangers. Facilitate quicker and more efficient emergency response by allowing emergency vehicles to communicate with other vehicles on the road and receive priority access.

III. Provide a communication framework essential for the safe and efficient operation of autonomous vehicles by allowing them to share information with other vehicles on the road.

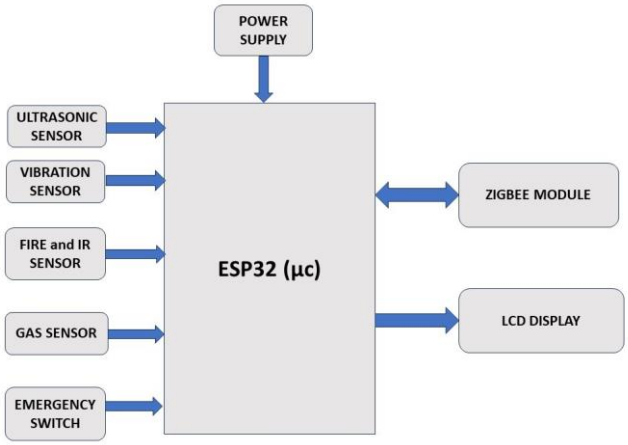
IV. Provide valuable data for transportation planners by collecting information on traffic patterns , congestion, and road conditions. This data can be used to optimize road infrastructure planning and design.

V. Facilitate vehicle platooning, where groups of vehicles travel closely together at consistent speeds, leading to improved fuel efficiency and reduced emissions.

3. METHODOLOGY

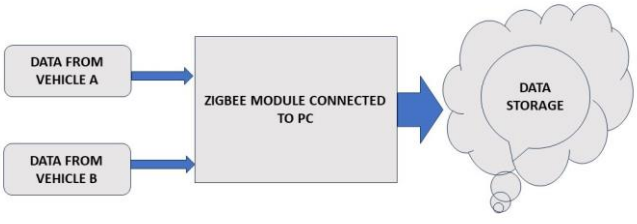
The automated control for two-way vehicle to vehicle communication system consists of two block diagram the first block diagram is for the vehicle A and vehicle B the second block diagram is to store the data for future analysis (investigation purpose).

3.1 BLOCK DIAGRAM 1



The above Block diagram 1 is for the vehicles in order to exchange the information between the vehicles. The block diagram consists of various type of sensors in order measure some of the parameter's and to measure the status of the vehicle and it has the Zigbee module for data exchanging the LCD display is used in order to display the real time status of the vehicle, buzzer is used to indicate the emergency situation. The microcontroller(esp32) is used to perform several operation depending upon the certain condition (sensor input) and the microcontroller(esp32) output will be given to the output devices. The power supply is used to power up the circuit.

3.2 BLOCK DIAGRAM 2



The above block diagram is to acquire the transmitted(exchanged) information from vehicles and it will be stored in the database for the further data analysis. The Zigbee module is used to acquire the data from the vehicles wirelessly. The Zigbee module is connected to PC.

4. RESULTS

Implementing automated control for two-way vehicle-to-vehicle communication using IoT can enhance road safety and traffic efficiency. By leveraging IoT devices installed in vehicles, real-time data exchange can occur, allowing vehicles to communicate with each other about road conditions, traffic congestion, and potential hazards. This information enables automated systems to make split-second decisions, such as adjusting speed or route, to prevent accidents and optimize traffic flow. Overall, this technology has the potential to revolutionize transportation by making it safer, more efficient, and more sustainable. **Fig 4.1** shows the prototype of the vehicles which is enabled with communicating technology using IOT. **Fig 4.2** shows the data which has exchanged between the vehicles are been stored for the future analysis and investigation purposes . **Fig 4.3** It shows the accident detected text message that has been sent to the owners of the vehicles.

Overall, automated control for two-way V2V communication using IoT technology holds immense potential to revolutionize transportation systems, making them safer, more efficient, and more sustainable. However, widespread adoption would require collaboration between automotive manufacturers, policymakers, and technology providers to address technical challenges, regulatory issues, and public acceptance.

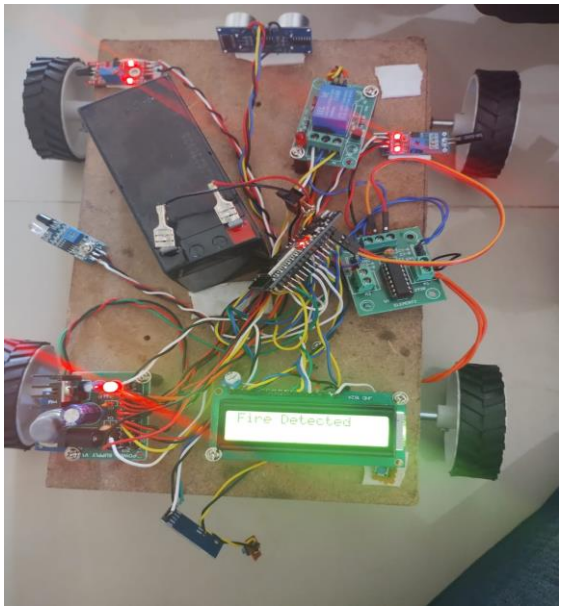


Fig 4.1 Prototype of iot enabled vehicle

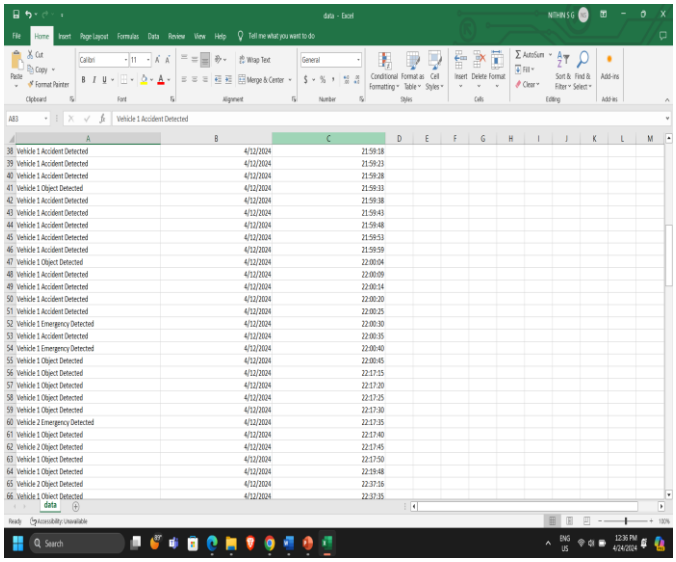


Fig 4.2 Exchanged Data storage

Fig 4.3 Accident detected notification

5. CONCLUSIONS

In this study, we have presented an automated control system for Two Way Vehicle to Vehicle (V2V) communication using Internet of Things (IoT) technology. The system aims to enhance traffic safety, efficiency, and management through seamless communication and adaptive decision-making among vehicles on the road.

In conclusion, it holds great promise for revolutionizing the future of transportation systems. By harnessing the power of IoT technology to enable seamless communication and intelligent decision-making among vehicles, we can create safer, more efficient, and sustainable transportation networks for the benefit of society as a whole.

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