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IOT-ENABLED INTELLIGENT TRANSPORTATION SYSTEM FOR EMERGENCY SERVICES

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***Abstract*:** In order to save lives, rescue missions are very important. During rescue missions, the standard implementation of the siren signal, such as the siren's light and sound, could be used to alert other nearby non-emergency vehicles. It is divided into two categories: Vehicle to Infrastructure (V2I) Communication and Vehicle to Vehicle (V2V) Communication. The siren signal does have some limitations, though. For instance, you need to have a clear line of sight to see any ambulances approaching. However, driving places a significant strain on eyesight. We have created a system in this project that uses V2V and V2I technologies to create a communication architecture for automatic traffic management. This architecture enables emergency vehicles like ambulances and fire departments to choose a route with less congestion based on data sent by sensors. Because there is no information contained in the siren sound, it also has the potential to mislead vehicles that are not responding to an emergency. It's possible that the other vehicles won't be able to tell exactly where the ambulances are. A2V contributes to the advance sharing of emergency information between ambulances and other nearby vehicles. As a result, the other vehicles will be able to anticipate exactly where the ambulances are and which lane or route they will take.

Our comprehensive performance simulation and analysis show that A2V significantly improves ambulance's speed by more than 40%, while the other non-emergency vehicles' speeds are rarely reduced by less than 6%.

I. INTRODUCTION

The Internet of Things (IoT) has changed the way we interact with one another and with our surroundings. The ability to communicate with emergency vehicles in the event of an emergency has greatly improved with the introduction of IoT-based emergency vehicle communication systems. In addition to offering an effective means of communication between the emergency vehicles and the authorities, this system can provide information on the location and status of emergency vehicles in real time. Additionally, the system may offer a cost-effective method for gathering information about the performance of emergency vehicles, which can be used to enhance

their efficiency and safety. In this paper, we will look at the difficulties that need to be overcome in order to ensure the success of IoT-based emergency vehicle communication systems as well as the potential advantages of such systems

Transportation delays, traffic congestion, and traffic blockages are now unavoidable as a result of the worldwide increase in the number of vehicles. These issues may not cause any significant issues for non-emergency vehicles. However, in the case of ambulances, a slight delay in transportation could result in additional losses, including the loss of life. Consequently, during rescue missions, reducing transportation delays, traffic congestion, and traffic blockages is extremely important.

In the situations described above, technologies like VANETs can be useful and are essential. Utilizing GPS and GSM in conjunction with Arduino can result in a low-cost, simple-to-implement model that can offer assistance in real time in both situations—choosing routes before moving and notifying the appropriate authorities in the event of an accident.

As a result, a novel Ambulance to Vehicle Communications (A2V) is proposed in this paper to address road traffic management in the event of a straight road and highway, prioritize ambulances, and improve rescue mission performance. The following is a description of A2V's primary contributions

• A2V makes it possible for ambulances and other non-emergency vehicles to communicate in a way that is decentralized—that is, each vehicle can make its own decisions without having to involve any central units.

• Other vehicles can be informed of rescue information in advance, including ambulance speed and location, rescue route and lane, and rescue destination.

• To clear the high-speed lane for the ambulance, other vehicles use shared information rather than the siren signal.

• As a consequence of this, rescue operations are improved and more lives can be saved.

Six sections further divide the paper. The project's problem statement is in section II, and the literature review is in section III. The system's design and testing are covered in sections IV and V, respectively. In conclusion, section VI offers a conclusion.

II. RELATED WORKS

Due to a lack of communication with other vehicles along the rescue routes, most ambulances today are unable to move as quickly as they used to. In the case of ambulances, the siren signal is frequently used. However, the siren signal does not provide any information about the approaching ambulances' location, speed, direction, or route. As a result, the majority of vehicles might not be able to quickly clear the path for rescuers. After spotting the ambulance's siren light, you might not have enough time to change lanes. As a result, traffic management systems that are more intelligent are absolutely necessary. The standards and current state of the art in this field are reviewed in this section.

Hospitals are typically located at junction points in urban Sindh province cities like Hyderabad, where there is a lack of pre-planned infrastructure and where routes are extremely busy and occupied throughout the day. Emergency vehicle drivers do not have any kind of up-to-date information about the particular route to follow whenever there are traffic jams as a result of a rush of vehicles, roadblocks as a result of public protests, or construction works at any route connecting to the hospital. As a result, the emergency vehicle follows the same route and becomes stuck, delaying emergency operations and adding to the already congested route. Any kind of accident or damage that occurs on the path can be considered difficulty. In the midst of the congested traffic, a lot of the emergency vehicles, like ambulances and fire trucks, also get stuck, which sometimes results in fatalities. An emergency vehicle driver needs a system that can direct them in real time to the best route to take in order to reach people and save their lives. In addition, a cost-effective system that provides immediate updates on any vehicle or emergency vehicle that encounters an accident while en route to the responsible authorities for rescue assistance is required.

III. LITERATURE REVIEW

In order to assist in the development of smart transportation frameworks, vehicular ad hoc networks, or VANETs, are increasingly appearing in portables with specially designed system advancements that combine multiple steering conventions for the information of interchanges between vehicles.

The author of "Internet of Things for Smart Cities," Andrea Zanella, discusses the power of IOT and the seamless global monitoring provided by remote monitoring systems in the IEEE Journal. A IoT device for remote monitoring of vehicle and other parking systems is proposed in the paper.

The author of the Instructables.com article titled "Blynk with NodeMCU ESP8266" explains how to connect the Blynk server for data transfer between the NodeMCU and Remote Blynk Application.

The goal of the proposed A2V is to make it possible for any nearby ambulances and other non-emergency vehicles to communicate and share information in advance. As a consequence of this, the other non-emergency vehicles are able to properly clear the high-speed lane for the ambulances. This paper proposes Lane Changing Distance (LCD) as the distance between an ambulance and any other non-emergency vehicles that will switch to the low-speed lane to allow the ambulance to pass. Every emergency WAVE Short Message (WSM) contains this LCD. Ambulances will broadcast the WSMs at a rate of one WSM per second.

On Board Units, or OBUs for short, are GPS units, sensors for V2V communication, and omnidirectional radio wires. In addition, vehicles engage in V2I interchangeability with roadside frameworks, also known as Roadside Units (RSUs), which are positioned within a fixed distance of one another based on the correlative scope of the roadside devices. RSUs are typically adaptable because they communicate with one another through some remote medium or wire associations. Since RSUs can also be linked to a system, the V2I interchanges can first be used to provide applications like "Internet." The V2V correspondences can be used to send constant information about any crisis, such as an accident or massive traffic jam, so that other vehicles can take a different route to avoid further traffic congestion.

As the number of vehicles rises in a city with a lot of people, the ratio of accidents to traffic congestion rises as well. During an accident, traffic jams on the roads frequently lead to chaos, making it difficult for a rescue vehicle to assist. A prototype for an Internet of Things (IoT) and Vehicle Area Network-based automatic accident detection and prevention system has been developed for these scenarios. The proposed system can use sensors to measure distance to prevent an accident and to detect an accident if one does occur. The location obtained by GPS will be communicated to all cars in the particular area by the vehicle connected to a server.

IV.METHODOLOGY

Micro simulation was used in this study to see if V2V communication could make an ERV response more efficient (i.e., cut down on travel time) under various traffic flow conditions. VISSIM was selected as the simulation tool. In order to influence the actions of non-ERV drivers, the simulated ERV communicated with other vehicles on its path and sent messages. When an ERV was approaching, non-ERV drivers received messages that directed their movements. The ERV, for instance, sent commands like "move to the right lane" or "move to the left lane."

V.AMBULANCE-TO-VEHICLE COMMUNICATIONS

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➢ EMERGENCY RESPONSE VEHICLE TRAVEL TIME EXPERIMENTATION

Numerous factors influenced the ERV travel time. The addition of V2V communication was anticipated to shorten the ERV travel time by the research team. Using V2V communication, the research team carried out four experiments (experiments 20–23). The non-ERVs were given straightforward instructions to "move to the right," "move to the left," or "stay where you are" during the experiments (Figure 1). Non-ERV movements were not optimized when the ERV was present.

The length of the warning distance or message broadcast range, which was set to 328 feet (100 meters) in experiments 20 to 23, and the warning speed 12 ought to be included in the simulation for subsequent experiments. In these experiments, the V2V communication was used to see how, in the absence of movement optimization, simple messages or commands sent through the VISSIM communication module affected the ERV's travel time. It is anticipated that optimizations will also reduce travel time.

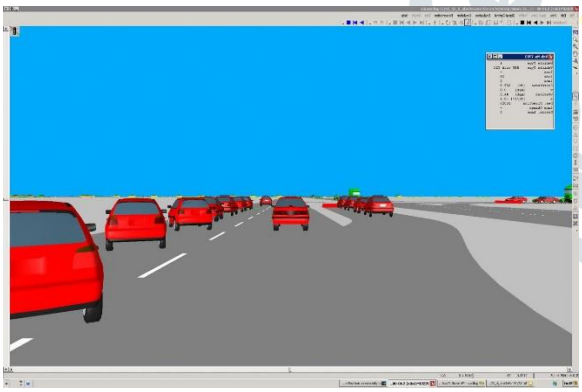

Fig 1 Vehicles moving to the right based on a message received from the ERV.

➢ FLOWCHART

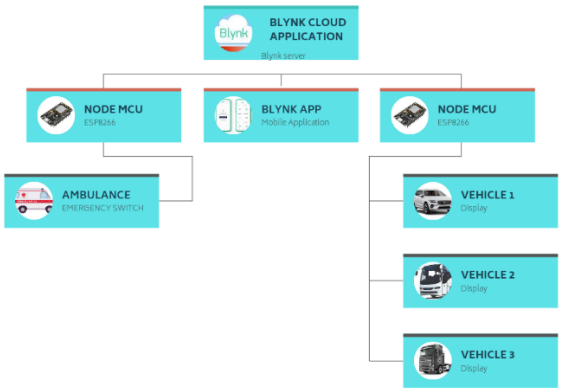

Fig:2 flowchart

➢ PROPOSED MODEL

The concept of vehicle-to-vehicle communication has been proposed by the project. By connecting straightforward ambulance to vehicle communication, it has been experimentally demonstrated that the Internet of Think-based ambulance-to-vehicle communication works effectively.

The vehicle now takes the preferred route, as shown in scenario 2, after selecting the route in scenario 1. The emergency vehicle encounters an accident as it heads toward its destination. As programmed, the emergency vehicle's onboard sensors respond quickly to the collision.

When the emergency vehicle collides with another vehicle, the vehicle server sends a GSM message to the appropriate rescue authorities informing them that the following emergency vehicle has been hit and requires rescue. The message includes the vehicle's pin location.

VI.WORKING PRINCIPLE

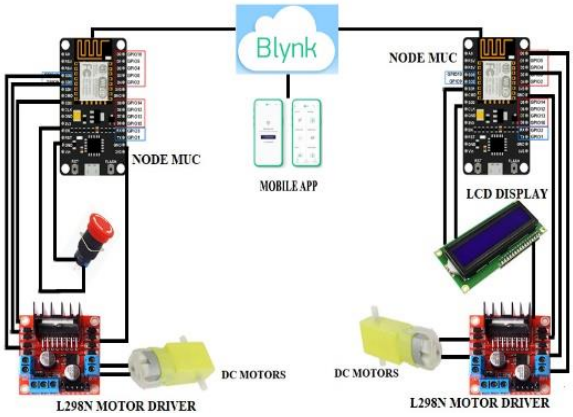

Fig:3 circuit diagram

The emergency alert button goes off. The data is processed by the Node MCU (ESP8266). The idea of Virtual Pin Communication using Wi-Fi Technology (ESP8266) transfers the data from the NodeMCU to the Blynk cloud. Any remote smart device that is installed with the Blynk App receives the data from the Blynk Cloud. According to Algorithm 1, both vehicles V2 and V3 will participate in channel contention in order to rebroadcast the emergency WSM to the subsequent communication hop. The processed cloud data alerting message sent to the vehicle ahead of the ambulance Any proposed contention mechanism, like 3P3B, could be used to compete for the channel. The contention mechanism will not be discussed in greater depth in this project due to space constraints.

VII.RESULTS AND DISCUSSION

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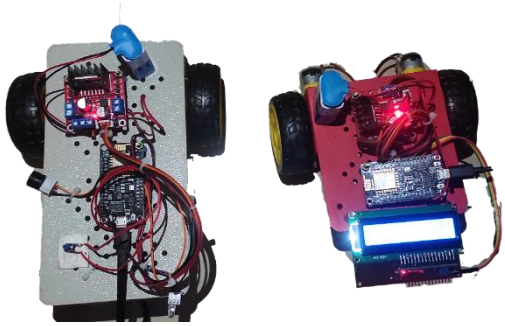

Fig 4 demo kit

VIII.CONCLUSION

This undertaking proposes an execution of vehicular interchanges to permit correspondences among ambulances and other non-crisis vehicles called Rescue vehicle to-Vehicle interchanges (A2V). Ambulances can now get to fire-damaged buildings, crime scenes, and hospitals much more quickly thanks to A2V's expedited movement.

Comprehensive performance simulation and analysis show that A2V significantly improves ambulance speed by more than 40%. In contrast, a speed decrease of less than 6% rarely affects the speed of other non-emergency vehicles. The decrease in speed experienced by non-emergency vehicles is negligible in comparison to the significant speed improvement experienced by ambulances. As a result, A2V emerges as one of the promising options for enhancing future rescue missions.

The implementation of IoT-based emergency vehicle communication systems presents a promising approach to enhancing public and emergency responder safety. These systems can help cut down on response times, increase safety, and improve situational awareness by providing reliable data in real time. The efficiency of these systems can be further enhanced by integrating them with other systems that are already in place, like cellular networks. Emergency vehicle communication systems that are based on the Internet of Things can also be used to help avoid collisions and gain a deeper understanding of the

weather and road conditions. These systems offer a promising approach to enhancing public and emergency responder safety, despite the fact that there are still a few obstacles that must be overcome before they can be widely used.

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