Automatic Vehicle Detection and Alert System

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Abstract. In India 80% of the deaths are due to accidents so as to prevent this Vehicle-to-Vehicle Technology has come into existence. This V2V technology not only prevents accidents but also detects them. This V2V is a subset of ITS. V2V is vehicle-to-vehicle communication in which vehicles exchange information about speed, location, and direction of travel, establishing a comprehensive awareness of vehicles in close proximity to the driver from all directions. The current system includes both prevention (via vibration sensor) and detection (via Google Maps integration). Both prevention and detection are addressed in the proposed paper. When it comes to prevention, DSRC is a wireless network used for communication. The operational range of V2V is 250m. This technology is especially useful in hilly areas where a vehicle in the blind spots may not be detected by the driver. Instead of DSRC, we can use ZigBee or Bluetooth for communication. The obstacle is detected using UV sensors and alerted by a buzzer; when it is out of range, the vehicle automatically stops. When it comes to detection, this is primarily based on the accelerometer, which detects the accident. The identification and creation of an accident location, as well as the sending of a message and location, will be accomplished using GPS and GSM. The main advantages of this system are cost effectiveness, assurance of safety, the ability to save victims' lives quickly, efficient time consumption, and a reduction in the possibility of human error.

Keywords: ZigBee, DSRC(Dedicated Short Range communication), ITS(Intelligent Transport System).

1. Introduction

In today's busy world many technologies are emerging out every day, there are many technologies which proved to be milestones in life of humans one such technology is V2V technology: V2V means vehicle to vehicle technology; it is a communication between two vehicles. The speed, location and other information will be shared to

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other vehicles which are nearby. This technology works to decrease the accident rate by giving a 360-degree awareness to the surroundings. Vehicular communication systems encompass computer networks where vehicles and roadside units serve as communicating nodes, exchanging information such as safety alerts and traffic updates. DSRC (Dedicated Short-Range Communication) is a technology utilized to implement this form of communication ranges only up to 250m or by using wireless devices like ZigBee, the other component to be used are UV sensors with which we can detect the obstacles based on the frequency, V2V technology. The below figure gives the view of the car internally and how it detects.

2. Literature Survey

V2V communication comprises computer networks where vehicles and roadside units function as communication nodes, exchanging information such as safety warnings for protection and traffic details.V2V communication transfers messages in a range of exceeding 300 meters and also identify dangers occurred by bad weather condition, landscape and traffic.V2V communication improves the crash avoidance system which utilize the cameras and radars to identify the collisions. V2V communication allows you to exchange of information between the vehicle wireless regarding their speed and location. Shuang Xiao et al.V2V communication is the combination of neural network and device-to-device communication [1]. Vehicle-to-infrastructure (V2I) and V2V communication are the two basic types of vehicular communications. The transmitting of the vehicles done by cellular base station (BS) that helps to realize the infrastructure-to-vehicle(I2V) communication depend upon the downlink channel and vehicle-to-infrastructure(V2I) depend upon the uplink channel. For V2V communication many clustering methods are applicable in order to enhance the spectrum usage or implementation.

Vehicle communications have been extensively developed to support the Intelligent Transportation System's requirement for a dependable and low-latency service (ITS). In the meantime, sufficient capacity is required for vehicle information transmission. To control traffic at road junctions, automated vehicles employ a variety of sensors to communicate with other vehicles. Sensors and current technology are integrated in autonomous vehicles for self-management communication. Communication between automated vehicles is used to control traffic on highways and city streets [9]. Some have suggested V2V communication-based MIMO technique to shorten the communication delay. Multiple-input-multiple-output technique is the wireless technology that utilizes multiple transmitter and receiver to transfer more data at the same time. MIMO, which stands for Multiple Input Multiple Output, involves radio links equipped with multiple antennas on both the transmitter and receiver ends. The spatial dimension is leveraged by employing several antennas to improve the efficiency of the wireless connection. MIMO systems utilize multiple radios and antenna arrays on both ends of the wireless link. While the immediate advantage

involves boosting received signal strength through signal combination, MIMO also facilitates the simultaneous transmission of parallel data streams, leading to increased throughput. [2].

Now our ideology is about to reduce accidents at the hilly areas. Bhumika et al. Due to sharp turns, unexpected bends, and the susceptibility or unique characteristics of roadways, inclined sections are more susceptible to accidents. The project aims to reduce accidents on hairpin bends, enable efficient and smooth vehicle movements, decrease driver uncertainty at critical points, provide assistance in emergencies, and issue landslide alerts. This study focuses on a module employing the Internet of Things and wireless sensor networks to monitor and enhance security in sloped areas. Wireless Sensor Networks (WSN) deploy self-contained detection devices in areas prone to the mentioned factors [7]. These sensors then transmit information to personnel regarding the potential for an incident, subsequently triggering an alert to notify everyone, enabling prompt assistance and preventive measures to mitigate the disaster or minimize its impact. The setup involves an ultrasonic sensor, buzzer, and connectivity options such as Zigbee, Bluetooth, and DSRC services. The use of Dedicated Short-Range Communication (DSRC) ensures the reliability and efficiency of all data transfers. Vehicles are fitted with wireless communication devices, sometimes known as DSRC devices, to enable the sharing of control information [3].

Here, cars come with a basic computer chip and GPS. This technology is especially helpful in mountainous places where there may be a car in the blind spots that the driver may not be able to see in this situation. Accident detection involves the utilization of a piezoelectric sensor, ensuring prompt and accurate communication of accident details to emergency services. The application of the Critical Hint Framework contributes to accident prevention in hairpin curves and foggy areas. The framework captures information exchange between vehicles, considering factors such as speed and distance, offering calculated choices through visual presentations to enhance decision-making [5]. Sensor technology is employed to prevent accidents by activating LED lights, emphasizing automotive advancements. A real-time system effectively prevents accidents on sloping tracks. Additionally, a system capable of identifying signs of driver fatigue regulates vehicle speed to prevent accidents. Guidance on sloped terrain is provided. An accident prevention system incorporates ultrasonic sensors, resulting in fewer accidents on curved roads due to flashing LED lights when a vehicle approaches [4]. Another system for accident prevention combines a vibration sensor, LED lights, ignition key, and a DC motor. This arrangement anticipates vehicle theft by employing message, audio alarm, location, and photo options. The current setup addresses the unpredictability of vehicles approaching turns, supporting a model that assists drivers in better navigating curves and assessing the presence of vehicles from a distance. This approach is comparable to how a speed trap aids authorities in taking legal action against a vehicle owner violating traffic laws. Now we can also use buzzers to alert the driver and prevent them from accidents. It will be more beneficial as A buzzer or beeper is an audio

signal device, which can be mechanical, microelectronic, or piezoelectric (often referred to as piezo). These devices find common applications as alarm clocks, timers, train horns, and for confirming human input such as a mouse click or keyboard action. In operation, when the magnetic field is activated, a flexible ferromagnetic disc is attracted to the coil; when deactivated, it returns to its original position [8].

This mechanism helps identify the vehicle before it is in motion, serving as an alert for the driver to remain vigilant. The buzzer generates an oscillating magnetic field, causing the disc to vibrate as the signal is pulsed through the coil. The audible sound emitted by the vibration sensor results from this vibrating motion. The utilization of vibration sensor proves beneficial as they produce sound, serving various purposes [6].

3. Methodology

Vehicle to vehicle communication involves the exchange of data between one vehicle to another. This happens in 6 major steps:

STEP 1) First the obstacle is detected using UV sensors depending on the frequency it is recognized.
STEP 2) Now this information is communicated using DSRC or ZigBee Technology (wireless technology)
STEP 3) This detection is based on three parameters i.e Distance, Speed and Range.
STEP 4) If the distance is less than 25m and based on vehicle speed the buzzer will be activated.
STEP 5) In this we mainly used a buzzer sensor, an audio signal device. These buzzers alert the driver when a vehicle appears nearer. The UV sensors enable us to detect the vehicles in the surroundings. When a vehicle come in proximity to another vehicle then the chip and GPS gets activated and sends a message to the buzzer sensor so that it will produce a sound and the driver gets alert and required steps will be taken. The main idea behind this is to provide a 360-degree awareness to the driver so that the accidents will reduce and the death rate will also get reduced.
STEP 6) In case of accidents we have a message sending facility that sends a message to the number we have given in the SD card through accelerometer sensor. The location will be identified and send to number using GPS and GSM.

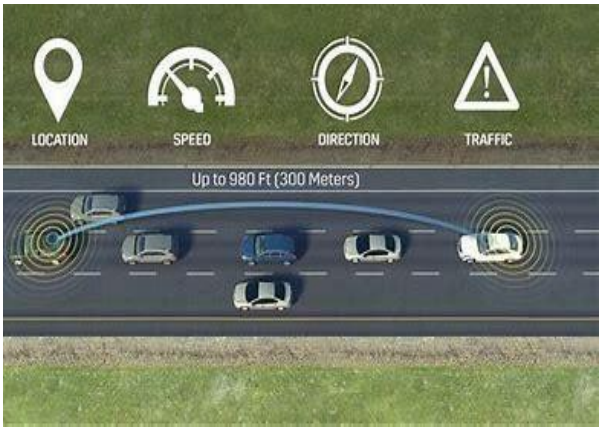

Fig 1: Accident Prevention

3.1 Algorithm:

STEP 1: Connect ZigBee device with a mini-Arduino board.
STEP 2: Connect the buzzer with the Arduino board.
STEP 3: Run an infinite loop.
STEP 4: Release the signal if the ZigBee device detected a vehicle nearby.
STEP 5: Released signal is taken as an event to the Arduino board.
STEP 6: Right after detecting a signal in a loop the power source (battery) will be released to the buzzer.
STEP7: In case of accidents occur, a message including location will be sent.

Prevents the rate of accidents being recorded every year. Merits include:Aids in mitigating traffic congestion by enabling real-time alerts to drivers, facilitating the monitoring and management of traffic, Regular updates of the traffic., Helps in streamlining the flow of vehicles on the road, Enhances direction and route optimization, enabling drivers to reach their destination more efficiently with the assistance of this technology, Improving fuel efficiency, Providing assistance to drivers for example giving info during parking i.e giving the information about parallel parking, Sending location and messages, which could help the victim with a quick treatment. And its demertits are: Security measures:Possible risks involve the potential loss of control over a vehicle to an unauthorized individual through a compromised system. This could lead to undesirable outcomes such as the locking of car doors or the engine surpassing speed limits. Government Liabilities:The V2V technology is still in its early stages, and comprehensive guidelines have not been firmly established. Instances involving vehicles equipped with V2V capabilities may raise concerns regarding liability. Privacy:The integrated network for vehicle-to-vehicle communication handles private data related to individual drivers. Due to the

lack of robust regulations overseeing this technology, both private companies and the government can potentially track vehicles, monitoring both drivers and their driving behaviours. Entities equipped with Automated License Plate Readers (ALPR) have the capability to observe and gather data on vehicles utilizing V2V communication. If such data were to be compromised through hacking, it could pose significant risks to personal privacy and raise broader security concerns.

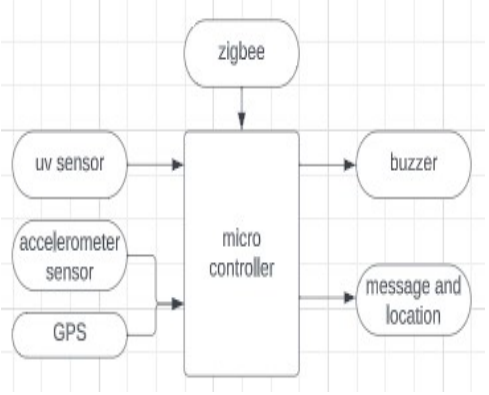

Fig 2: Working (If the obstacle is behind the vehicle)

4 Results:

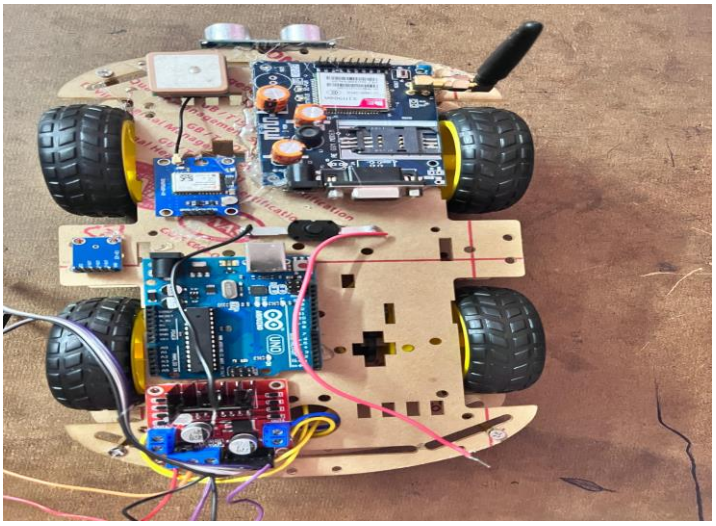

Fig 3: Hardware Component(GPS-GSM)

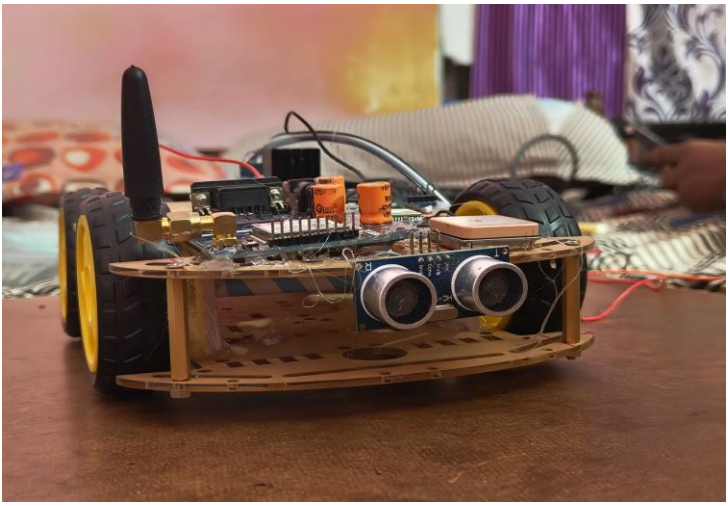

Fig 4: Hardware Component(UV sensors)

5 Conclusion and Future Scope

The potential of vehicle-to-vehicle (V2V) communication, enabling wireless data transmission about nearby cars' speed and location, holds great promise for preventing collisions, alleviating traffic congestion, and improving the overall environment. This innovative system provides an ideal solution to the inadequate emergency services provided to road accident victims. Through the use of advanced technology, immediate action can be taken to alert the appropriate parties via messaging. According to the World Health Organization (WHO), vehicle accidents contribute to over 1.2 million annual deaths globally, constituting a quarter of all injury-related fatalities. Implementation of V2V communication could serve as a significant advancement in vehicle safety systems, potentially leading to a substantial reduction in annual lives lost. The automobile industry stands to gain greatly from the suggested approach, which makes it possible for medical personnel to act quickly and save many lives. It is significant to remember that this system is not dependent on a network and could work in places with inadequate network coverage. Interactions, safety and security are all improved by vehicle tracking. This technology could empower vehicles to take preventive measures, automatically controlling the vehicle when detecting imminent danger to avert disasters. This also includes an automatic braking system that slows down the car in the face of potential collisions, adding further layers of safety and innovation. We can clearly see that in the years to come, this technology will be a big part of our everyday lives. As a result, we could expect live tracking of the vehicle in the future work so that the tracker can locate the victim after they have been admitted to the hospital.

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