Special Issue of First International Conference on Management, Science and Technology (ICMST 2021)

Vehicle Monitoring using Connected Vehicle Systems

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Abstract

India is the most populated country. Traffic control is being a biggest challenge for the traffic police. Though the government is taking the necessary measures to control the traffic, the citizen's co -operation is less. Reaching the destinations is becoming the major task for the people of busy schedules and hurry which causes violation of traffic rules that lead to traffic congestion and accidents. Death rate is increasing day by day due to more accidents and people are exhausted by the severe traffic congestions. To reduce these traffic congestions and accidents we are proposing a model which will help to ensure the safety of riders and also the traffic congestions. In this paper we have proposed an IoT (Internet of Things) based model which will continuously monitor the values of the sensors attached to the engines and warns the riders through vehicle-to-vehicle applications of connected vehicle technology which has the potential to significantly prevent or reduce the impact of millions of accidents every time when the accident or a traffic congestion are ahead to them.
Keywords: Accidents, Traffic Congestion, Connected Vehicle Technology, Sensors, Alarms, IoT.

1. Introduction

India stood in second place in population. The population is increasing, usage of the daily needs is also increasing day by day. Automobiles the means of transport is also increasing day by day by which challenges to the traffic police for traffic control and the accidents has also become a major concern. Although the government is taking the required measures to manage the traffic, the citizen's cooperation is in a smaller amount. In the busy schedules and hurry reaching the destinations is the major key task for the individuals. Traffic congestion and accidents on road have become a major concern for the people as well as the government due to violation of the traffic rules, which results in fatal accidents. Some accidents might happen because of the failure of the accessories where the driver might have overlooked the condition. Some might be due to the over speed, overtaking the other vehicles and the other causes. IoT is been employed in form of the areas like transportation, health, agriculture and etc. "Automotive IoT" refers to the embedding IoT technologies that make the vehicles smart and intelligent and providing safe and comfortable driving for all the users. Some of the automobiles are equipped with internet, sensors, and actuators, and over fifty microcomputers running in way over a hundred million lines of code. This automotive technology helps to monitor condition of vehicle which in turn needs the brakes, engine, tires, and

gas. The Vehicle-to-vehicle (V2V) communication is the application of the Connected Vehicle Technology which allows the vehicle to send and receive the data regarding the speed, location to the surrounding vehicles by the broadcast of the omnidirectional messages up to 100 meters. The vehicles with this application would receive these signals and beware of the traffic congestion ahead or be careful of the accidents that might happen. This technology uses visual and hearable alerts to the drivers continuously which would require to avoid accidents. Vehicle to Vehicle communication extends crash shunning systems that use radars and cameras to find collision threats. Vehicle to Vehicle communication technology varies from all different vehicles, even the pedestrians might sooner receive this technology which can give the signals to the drivers and be careful while driving. For the vehicles which are not smarter, we propose a model that monitors the sensors, PIC Micro Controller and LED lights and alarms to make the driver alert from the accidents. An associated vehicle is one that is fit for interfacing over remote organizations to close by gadgets. Associated vehicles are a significant factor in the development of IoT. The utilization cases range from associated theatre setups that interface with the driver's cell phone to Internet-associated vehicles that have bi-directional correspondence with different vehicles, cell phones and city crossing points. Associated vehicle is an innovation with wide ramifications. As we partook in our blog entry, Safety Trends in Traffic Management, associated vehicle innovation is important for the Intelligent Transportations Systems government activity, and there are numerous dynamic preliminaries around the globe today. The crucial use case for the smart vehicle is its wellbeing. The vehicle must communicate with other vehicles and also the road sides. Yet, there are numerous different instances of associated vehicle innovation at work in the car IoT space also.[1-6].

2. Working Principle

Associated Vehicle is a program that works with so many things in the world to empower vehicles, transports, trucks, trains, streets and other foundation, and our cell phones and different gadgets to "talk" to each other. This program works with state organizations, gadget producers,

and people. Vehicles on the parkway, for instance, would utilize short-range radio signs to speak with one another so every vehicle out and about would know about where other close by vehicles are. Drivers would get notices and cautions of perilous circumstances, for example, somebody going to run a red light as they're approaching a crossing point or an approaching vehicle, far out past a bend, turning into their path to maintain a strategic distance from an article out and about. Associated vehicles could drastically decrease the quantity of fatalities and genuine wounds brought about by mishaps on our streets and interstates. While the quantity of individuals enduring accidents has expanded fundamentally on account of airbags, electronically monitored slowing mechanisms, and other innovation, the USDOT is moving its concentration from assisting individuals with enduring collides with keeping crashes from occurring in any case. Consistently, there are more than 5 million accidents on our streets. Of these accidents, more than 30,000 individuals actually kick the bucket, and a lot more support genuine wounds, as indicated by the National Highway Traffic Safety Administration (NHTSA). Truth be told, the main source of death among little youngsters and youthful grown-ups is vehicle crashes, as per the Centers for Disease Control. Associated vehicle innovation will empower vehicles, trucks, transports, and different vehicles to "talk" to one another with in-vehicle or reseller's exchange gadgets that persistently share significant security and versatility data. Another NHTSA investigation of associated vehicle advance has indicated that they can possibly decrease the rate of accidents to maximum extent. where drivers are not incapacitated, saving a significant number of lives and preventing a large number of accident-related wounds each year. Associated vehicles have critical favourable circumstances over new advancements presently bringing to light in excellent quality vehicles, for instance, radar, lidar, cameras, and different sensors. For a particular something, associated vehicle innovations and applications have a more prominent reach than on-board vehicle hardware, which is able to permit you to induce cautions of dangerous circumstances an entire lot sooner, giving more opportunity to retort and forestall a mishap. Likewise, associated vehicle innovation doesn't depend on "view"

interchanges to achieve success, not normal for radar. So, if a vehicle before of you is slowing down hard on the other side of a slope thanks to a deterrent, you'd get a warning despite the very fact that you just can't see and do not realize the hazardous circumstance creating. [7-12].

Fig.1. Identifying nearby vehicles

Associated vehicle innovation is likewise more cost-effective to introduce than radar and camera hardware in vehicles. this can empower it to become standard hardware soon essentially all vehicles, not simply extravagance vehicles. Notwithstanding the big security capability of associated vehicles, they additionally guarantee to create transportation alternatives and decrease time of travelling. Traffic directors will have the choice to manage the progression of traffic more effectively through high-level correspondences information accessible and forestall or diminish creating the blockage. this might significantly affect the climate by assisting with cutting fuel utilization and lessen emanations.[13-15]. Associated vehicles interface with an organization to Associated vehicles interface with a company to empower bi-directional interchanges between (vehicles, trucks, transports and prepares) and different vehicles, cell phones and framework for the aim of setting off significant correspondences and occasions. On account of city traffic and crossing point security, as an example, those interchanges can empower vehicles equipped associated vehicle innovation to constantly convey their areas and to urge near ongoing data that triggers a computerized reaction. Many researchers

have found many technologies to overcome the accidents and therefore the major traffic jams that always happen. The vehicles without the net facility to speak with other devices we might wish to propose an IoT model with the sensors connected to the vehicle within which the drivers get alerts from sensors to warn him that some obstacle is seen. The sensors and alarms alert the motive force from the traffic congestions and also the nearby vehicles. While taking reverse of car also many accidents occur due to the over confidence in driving so to create the rider to urge alerted whether the other obstacle is nearing to the vehicle while reversing, we might prefer to propose another IoT model which alerts the riders continuously when an obstacle is nearing by. during this model, we used different sensors like Vehicle Speed Sensor, Vehicular Motion sensor, PIC Micro Controller and LED lights and alarms to form the motive force alert from the accidents.
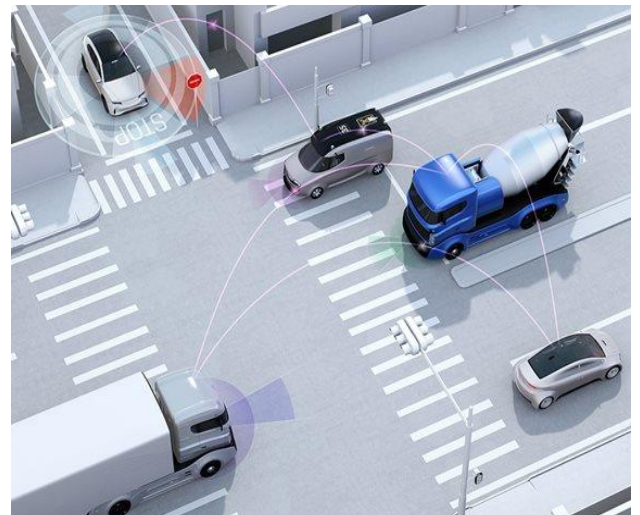

Fig.2. Vehicles communicating each other

3. Hardware Requirements

The Components of the Vehicle-to-Vehicle Communication are briefly explained below:

(i) **Dedicated Short Range Communications (DSRC)**: Vehicle- to- Vehicle communicates with the assistance of Dedicated short-range communications which might communicate up to 75Mhz and 5.9GHz which may be of the gap of 1000m from vehicle to vehicle. It enables real-time communication.

(ii) **GPS Receiver**: This component helps in sending the 1000-time information about the obstacles present on the trail and therefore the location of the vehicle.

(iii) **Inertial Navigation System**: The onboard sensors present helps to continuously monitor the position, speed and direction of the vehicle and also monitors the navigation of the opposite vehicles within the path.

(iv) **Laser Illuminated Detection and Ranging (LIDAR)**: A laser detection system that makes 3D maps and warmth images of the vehicle's surroundings. LiDAR calculates the precise distance between objects by measuring the speed of sunshine because it bounces from vehicle to object and the other way around. It helps the vehicle orient with the objects around it and interact with infrastructure sensors.

(v) **Vehicle Speed Sensor:** Vehicle Speed sensor is employed to live the speed of the vehicle. This sensor mainly works with the Hall Effect Principle. This sensor is given 12Volts from the key and it receives the signal indicates the speed of the vehicle from the hall switch.

(vi) **PIC Micro controller:** Peripheral Interface Controller microcontroller is accustomed to connect all the sensors and to watch their values. The microcontroller supports the hardware and software requirements and it consumes very low power with very high performance.

(vii) **LED Indicators:** We used the LED indicators to point vehicles to take care of the gap from the opposite vehicle.

(viii) **Vehicular Motion Sensor:** The vehicular motion sensors are mounted on the vehicle which consists of two the main parts:

1.To observe the obstacles within the path, which helps to watch the encompassing area.

2.An alarm for the user which alerts continuously when an obstacle comes nearby. Vehicle to Vehicle communication application continuously monitors the accessories of the vehicle and alerts the drivers altogether situations. The components like DSRC, GPS receiver, inertial guidance System and LiDAR during this technology alerts the drivers with various values like when another vehicle is nearby the vehicle the GPS receiver gives an alert that a vehicle is so nearby with may cause to a crash. The LiDAR system alerts the motive force if he increases the speed than it should.[16-20].

With vehicles getting more refined and more associated, vehicles today are interfacing with more complex, high-transmission capacity

organizations, to empower a scope of abilities. For instance, car IoT empowers rapid vehicle-to-vehicle and vehicle-to-framework correspondences to trigger the accompanying outcomes, huge numbers of which are conceivable today:

Fig.3. Showing the scope of the Vehicle

➢ Adaptive voyage control
➢ Automatic course arranging dependent on ongoing requirements.
➢ Traffic diverted away from clog
➢ Automatic refreshment of street signals, to report traffic conditions.
➢ Alerting the drivers from nearing the other vehicles and incorrect paths.
➢ Automatic vehicle slowing down to forestall impacts.
➢ Automatic vehicle control.

GPS is one illustration of an innovation that supports associated vehicle, as the GPS network permits a vehicle to design a course, considering current traffic conditions to dodge gridlocks. The refinement of GPS and its utilization by associated vehicles will keep on developing with lower-inactivity organizations and the development of associated vehicle innovation. OnStar is another model, with a vehicle interfacing with an OnStar delegate so a driver can get help when required. Today, associated vehicles are being outfitted with 4G collectors to make an in-vehicle hotspot. These are only a couple of the manners by which the present associated vehicles are coordinating with networks in keen urban areas and supporting advancement of the profoundly complex correspondences needed for self-governing driving.[21-24].

Conclusion

Internet of Things (IoT) is a network of physical objects or people called "things" that are combined with software, electronics, networks and sensors allowing these objects to collect and exchange data. IoT solutions are widely used in numerous companies and industries such as Smart Thermostats, Connected Cars, Activity Trackers, Smart Outlets, Parking Sensors etc. We propose a model which guarantees the reduction of accidents and the traffic jams up to maximum extent. The researchers can also go for further research upon the sensors and connected vehicle technology used in this model.

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