Comprehensive Study & Implementation of VANET System Using Internet of Things

Sombir [1], Kamna Solanki[2], Amita Dhankhar[3], Sandeep Dalal[4]
[1]M. Tech. Computer Science Engineering, U.I.E.T., MDU, Rohtak
[2]H.O.D CSE, Department, U.I.E.T., MDU, Rohtak
[3&4]Asst.Prof CSE, Department, U.I.E.T., MDU, Rohtak

Abstract: **This effort shows the idea to avoid collision among vehicles in rural zones with the help of Internet. It furnishes the diverse situations with development of vehicles. It considers the issue of crash shirking at vehicular crossing points for an arrangement of vehicles that are connected by remote correspondence. The security of driver is turning into a critical issue in the present time. The task is to diminish number of injuries on our roadways by collision. For this, it presents a controlling element utilizing approach of fuzzy logic for controlling the development of vehicles that keeps up a separation between vehicles. The fundamental piece of the work is to complete a practicality consider on vehicle crash evasion framework utilizing remote correspondence. The issue has real necessities: wellbeing, i.e. vehicular crashes must be dodged; non-blockingness, i.e. vehicles did not ought gridlock and must achieve their last goals, which for this situation implies they should totally cross the convergence. It exhibits the idea of vehicle development in single path, two path, movements path and so on. The way of projection of vehicle is likewise displayed by the utilization of controller. Their speed of propagation, separation from sides and angle of introduction are likewise estimated and assessed.**

Index Terms - **VANET, Internet of Things, Vehicle Collision Avoidance, Fuzzy Controller etc.**

I. INTRODUCTION

The web of things is a system of physical protest or things that are implanted with gadgets, programming and sensors being able to gather information from our general surroundings and offer information over the web. The idea of web of things was presented by the individuals from the radio recurrence recognizable proof advancement network in 1999.It is exceptionally famous in light of development of cell phones, implanted and continuous correspondence, distributed computing and information examination. Here are three C's of IOT i.e. Correspondence, Control and Automation, Cost Saving.

Savvy urban communities are territories where advancement is upheld through computerized systems and applications [1]. Shrewd urban communities are regularly called economical, computerized or associated urban areas [2]. The objective of changing over a city into a brilliant domain is to lighten the issues coming about because of urbanization and expanded urban populace. A keen city is an urban zone that gives the conditions to feasible monetary development and personal satisfaction. Savvy arrangements, similar to activity clog shirking [3], green structures and present day modern control frameworks (ICS), are a portion of the innovations that can make the present urbanization supportable. A shrewd city includes the insightful utilization of innovation to enhance how individuals live, work, drive and offer data.

A key part of a brilliant city is cutting edge vehicles that join new detecting, correspondence and social capacities as a major aspect of the more extensive Internet of Things idea. By giving versatile remote detecting and correspondences, vehicles can encourage information get to, which is key to make savvy urban areas a reality. The principle vision of the Internet of Things (IOT) is to prepare genuine physical articles with processing and correspondence capacities so they can connect with each other for the social great. The close ongoing applications offer sheltered and productive travel of the vehicle clients, and the disconnected information guarantees shrewd conduct of the vehicles and information examination for the vehicle specialists.
These days, remote correspondence innovations are connected in various territories of day by day life. Vehicles are being outfitted with remote specialized gadgets, empowering them to speak with different autos, and with brought together frameworks by utilizing street side foundation hubs. These correspondences offer new open doors for growing new applications for vehicles. By utilizing this innovation, the car business can enhance transportation frameworks productively. In vehicular conditions, remote advancements empower distributed versatile correspondences among vehicles (V2V), and interchanges amongst vehicles and foundations (V2I). Thus, vehicular systems are extensively utilized as a part of ITS.

Fig 1: Intelligent Transport System [1]

A VANET is a network that contains large number of vehicles that act as a node in the system. In this case, each vehicle provides interface to each other within the range of 100-300 m. It is a part of MANET system but main difference is the presence of vehicles in this network. It provides safety on the roads by reducing number of collisions. The main scenarios in VANET are vehicle to vehicle, vehicle to infrastructure or roadside etc. In V2V, the measurements are provided w.r.t other vehicles present. In other case, it calculates the criteria w.r.t roadside or other infrastructure present.

This area gives writing overview identified with vehicle impact evasion framework and gives different methodologies identified with them. A few creators [1] depicted the possibility of shrewd video security framework usage. Creators [2] built up a system for handling & info mating drivers before crash is going to happen. Analysts [3] exhibited an ongoing framework for impact evasion. It depended on portraying with bends using spline method. Creators [4] displayed a framework using impacts of vehicle with guardrail. Specialists [5] presented a determination calculation utilizing dispute window. As the dispute determination framework in standard 802.11, paired back-off has for some time been scrutinized in light of its elevated crash likelihood in dispersion circumstance. Creators [6] measured the impact evasion issue at vehicular crossing points for various kinds of vehicle movement in uncontrolled manner.

In this work, it thinks about the idea of automobile impact shirking framework with Internet of things. Further, in segment II, it gives the data identified with vehicle to web availability. In Section III, It characterizes proposed execution of framework. Results are clarified in segment IV. At long last, conclusion is clarified in Section V.

VEHICLE TO INTERNET CONNECTIVITY

Web network is turning into a fundamental and must have highlight of current vehicles. Remote access advancements to web assume a noteworthy part in giving web administrations to vehicle clients. The two promising arrangements are Cellular and Wi-Fi. The cell systems, for example, 3G and 4G-LTE, can give dependable and inescapable access administrations. The roadside Wi-Fi passages can be utilized for open air Internet access at vehicular portability. The Existing answers for interface vehicles to the Internet through generally conveyed cell arrange foundation, and can be separated into two classes, i.e., got and worked in.

Brought-in Connectivity

The acquired choice takes into account 3G/4G versatile clients who incline toward tying their own particular PDA to the auto. The most prevalent tying innovation, to be specific Mirror Link is fuelled via auto network consortium (CCC). Utilizing Mirror Link, the driver/travellers in a vehicle can associate the telephone to the vehicle infotainment framework through wires (e.g., USB) or remotely (e.g., Wi-Fi or Bluetooth), with the goal that the vehicle increases prompt access to the Internet and some copy elements of advanced mobile phones. Mirror Link-empowered vehicle infotainment frameworks are as of now in the market, for example, Toyota Touch 2. NFC can likewise be utilized to associate cell phone to the vehicle to get to web. In Hyundai i30, once inside the auto, the driver at that point puts their NFC telephone in the middle reassure, empowering the telephone to be connected to the i30's focal 7-inch contact screen. All the substance put away on the telephone, including music, telephone contacts, radio station inclinations, singular profile settings and web get to is given to the vehicle [12].
BMW Car Hotspot LTE gadget is a NFC adornment shoppers can use to get to quick web out and about. The gadget permits up to eight clients to consequently associate with the vehicle's Wi-Fi center point by tapping their NFC telephone onto the LTE logo of

the hotspot [13]. For iPhone clients, particularly, Apple as of late discharged CarPlay [5] as a standard of associating iPhone to autos. Goodbye pizzazz utilizes Harman's Connect Next as infotainment framework which is stacked with highlights like touch screen control for music, temperature and voice controlled activity.

Built-in Connectivity

Worked in choice coordinates cell benefit in the on-board infotainment framework. The Internet association depends on the implicit cell module, as opposed to advanced mobile phones of driver/travellers. Through implicit cell interchanges, BMW Connected Drive joins different online applications, driver help, call focus administrations, and answers for give Internet association with cell phone inside the vehicle. Audi interface [7] is another case of inherent arrangement. Chevrolet additionally built up the inherent answer for their autos which is the first and final auto organization to have worked in 4G LTE Wi-Fi to their autos. Worked in choices could give driver/travellers with more grounded associations and redid administrations contrasted with got choices.
The constraint is that the cell network can't develop once it is inserted. The fundamental preferred standpoint of inherent frameworks is that they don't depend on outer gadgets, dispensing with similarity or interoperability issues that can frequently be risky when carrying gadgets into the auto.

Drive-Thru Internet

The Drive-through Internet venture explores the ease of use of IEEE 802.11 innovation for giving system access to versatile clients in moving vehicles. Drive-through Internet is to give problem areas along the street - inside a city, on an expressway, or even on rapid turnpikes, for example, autobahns. With a large number of hotspots sent everywhere throughout the world, Wi-Fi can be a reciprocal answer for vehicular Internet access with ease. Ongoing exploration has exhibited the plausibility of Wi-Fi for open air Internet access at vehicular portability. The implicit Wi-Fi radio or Wi-Fi empowered cell phones in the vehicle can get to the Internet when the vehicle is moving in the scope of Wi-Fi hotspots, which is frequently alluded to as the drive-through Internet, This sort of Wi-Fi get to is deployable to offer an ease information pipe for vehicle clients, and ongoing advances in Pass point/Hotspot 2.0 make Wi-Fi more aggressive to give anchor network and consistent wandering [8].

II. PROPOSED IMPLEMENTATION OF SYTEM

Communication between different vehicles provides a better driving situation on the roads. It provides a better security for drivers to move on without tension or mis-happening. Safety of driver is crucial in today's technology era. Life is going very fast and all are quite busy in their life. No one has a time to wait for some time. Due to this, technology becomes so much advanced that helps to provide relaxation to drivers. There is development of Vehicular Ad-Hoc Networks technology that provides security to the drivers. Due to this, this work proposes a vehicle collision handling system in rural areas. It provides the controlling of vehicle movement by the use of internet.
For usage of framework, it utilizes the fuzzy rationale based controller for controlling vehicle speed. In fuzzy framework, the fuzzifier performs estimations of the information factors (input signals, genuine factors), scale mapping and fuzzification (change 1). In this way all the observed signs are scaled, and fuzzification implies that the deliberate signs (fresh info amounts which have numerical qualities) are changed into fuzzy amounts. This change is performed utilizing participation capacities. In an ordinary fuzzy rationale controller, the quantity of enrollment capacities and the states of these are at first dictated by the client. An enrollment work has an incentive in the vicinity of 0 and 1, and it demonstrates the level of belongingness of an amount to a fuzzy set. The enrollment work for speed is appeared in fig 2.

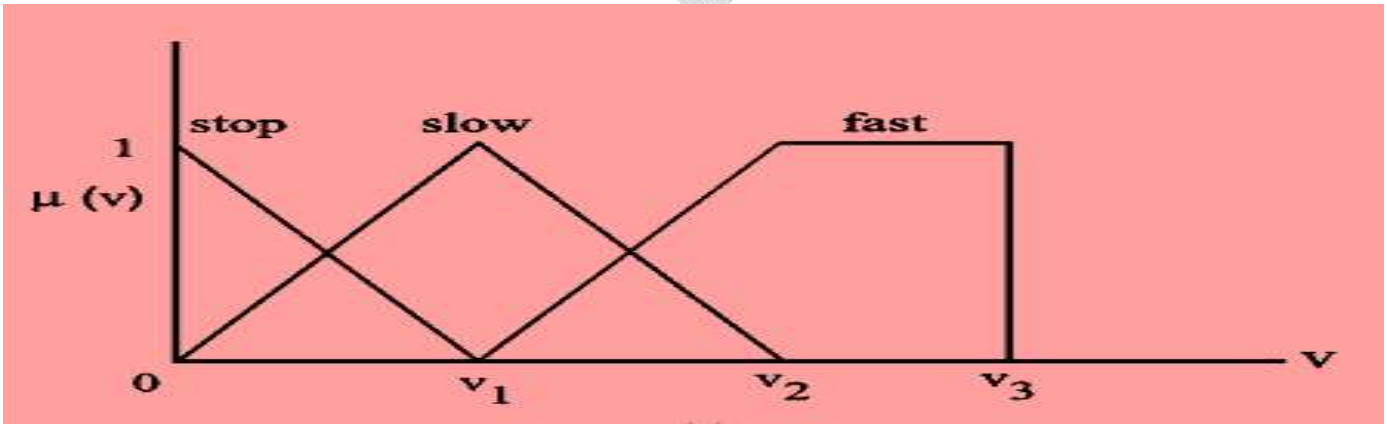


Fig 2: Membership Function for Speed

The membership function used here is to describe all related data that contained in fuzzy sets. This function helps to describe special attributes and also provide the desired response of system. In this work, it provides a smooth range lies between 0 & 1. The input space is called sample of discourse. For this, it provides a output mapping corresponding to the input values. It uses a trapezoidal membership function for providing speed and distance response of system. Other membership functions did not able to specify asymmetrical membership functions. This function has flat top and trimmed triangular shape. It is used because of its simplicity. The core and support are the part of membership function. core contains µA ~(x) = 1 and support contains µA ~(x) >0.

If x is A then y is B.
The enrollment capacities can take numerous structures including triangular, Gaussian, ringer formed, trapezoidal, and so on. The learning base comprises of the information base and the semantic control manage base. The information base gives the data which is utilized to characterize the etymological control rules and the fuzzy information control in the fuzzy rationale controller. The run base characterizes (master rules) indicates the control objective activities by methods for an arrangement of semantic standards. At the end of the day, the administer base contains principles, for example, would be given by a specialist.

Table 1: IF-THEN Rules for Linguistic Variables

IF	THEN
Left is Distant and Right is Distant	**Right is high, Left is high**
Left is Close and Right is Close	**Right is Slow, Left is high**
Left is Close and Right is Medium	**Right is Slow, Left is Slow**
Left is Close and Right is Distant	**Right is Slow, Left is Slow**

While the imagined situation of vehicles that trade data utilizing remote correspondence innovation to expand wellbeing on the streets is naturally persuading to numerous individuals, the specialized usage of simply that isn't as straight forward as one may think. These networks are faced by different type of issues or challenges. The figure shows the connected vehicle and transportation system. In this, vehicle is connected to communication service providers that helps to maintain movement on the roads.

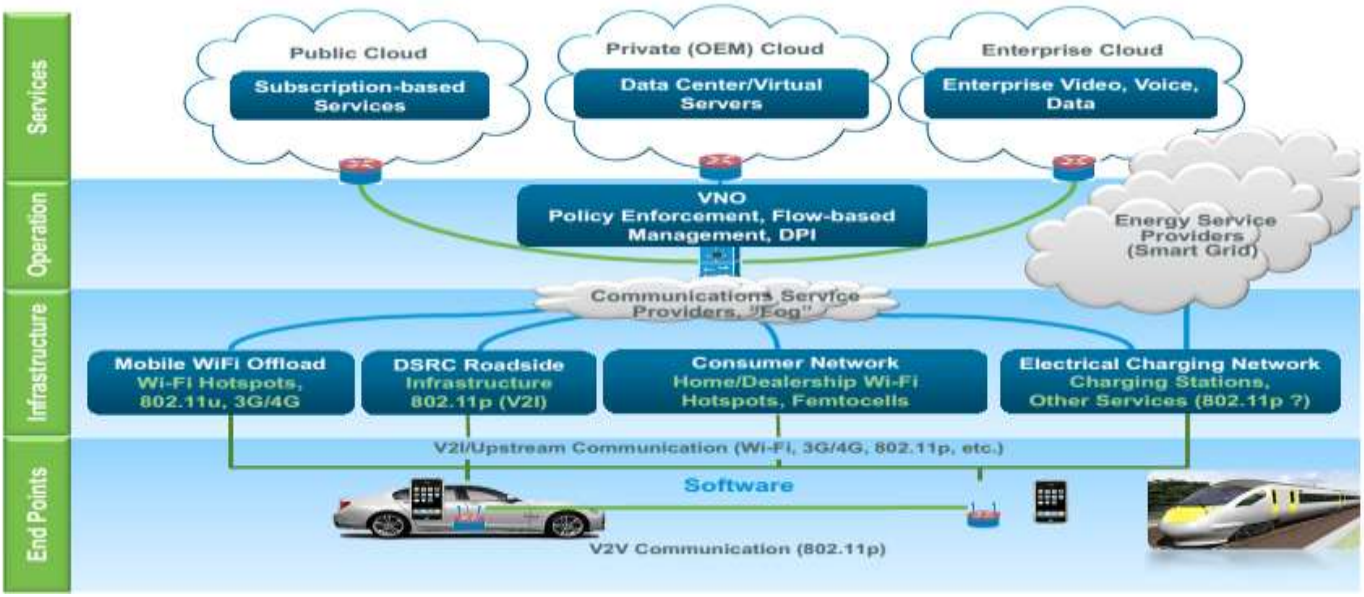


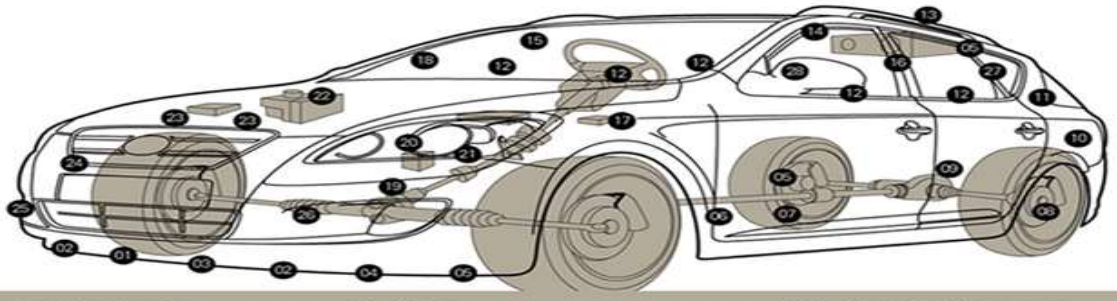
Figure 3: Connected Vehicle & Transportation

Avoiding a collision in systems administration predominantly shows up in systems with bearer sense numerous gets to. This depends on the rule that hubs that will transmit information need to tune in to the channel for quite a while to decide if different hubs are likewise transmitting on the remote channel. A hub can begin transmission just if a channel gives off an impression of being inactive, something else, transmissions are conceded. Crash evasion partitions the remote channels similarly among transmitting hubs inside the impact area. It's supplemented by trading solicitations to send a parcel. Hubs inside senders and collectors are cautioned not to transmit for the span of fundamental transmissions.

The system needs to help two sorts of security messages: occasional mindfulness Messages which are communicated by any vehicle to advise neighbouring vehicles about the claim Closeness and status, and in addition occasion driven alarm messages which are conveyed if there should be an occurrence of a crisis circumstance that requires a prompt notice of conceivably

influenced neighbours. While intermittent messages are imagined to be just a single jump communicated and named either Cooperative Awareness Message (CAM) or basically "reference point", occasion driven messages might be dispersed over in excess of one bounce. The system needs to help situations in which just a modest number or up to a few several vehicles need to impart, henceforth it must be flexible and adaptable.

this work proposes a vehicle collision handling system in rural areas. It provides the controlling of vehicle movement by the use of internet. Internet helps to control the velocity of vehicles by providing signals of Close by vehicle and also maintains a distance between them. Different scenarios are studied and implemented. It is not to create any extra dangers for other street clients. This choice module should consider the street attributes, the claim vehicle development, the obstructions and ought to create moves that are doable practically speaking as indicated by vehicle elements and ought not shock for the drivers. The vehicle internal sensors are shown in figure below.



1. Road condition sensor
2. Magnetic sensor
3. Vehicle distance sensor
4. Forward obstacle sensor
5. Blind spot monitoring camera
6. Drive recorder
7. Side obstacle sensor
8. Air pressure sensor
9. Inside door lock/unlock
10. Rear obstacle sensor
11. GPS sensor
12. Airbag
13. Road-to-Vehicle / Vehicle-to-Vehicle communication system
14. Rear view camera
15. Water repelling wind shield
16. Seatbelt pretensioner
17. Driver monitoring sensor
18. Headup display
19. Steering angle sensor
20. Electronic control throttle
21. Electronic control brake
22. Fire detection sensor
23. Vehicle speed, acceleration sensor
24. Collision detection sensor
25. Pedestrian collision injury reduction structure
26. Electronic control steering
27. Message display system
28. Hands-free system

Figure 4: Vehicle Containing Internal Sensors

Step 1: Choose a path
Step 2: Movement of Vehicles in Rural Areas
Step 3: Apply Fuzzy Logic
Step 4: Apply on Various Scenarios
1: if automobile movement in same lane next
If V €L (same Lane) next
If D< T (threshold) next
Base station communicate with V
end
end
If V €L2 (opposite Lane) then
If D< T (threshold) then
Base station communicate with V to adjust distance & velocity
end
end
End
2: If V €L3 (odouble Lane) then
If D< T (threshold) then
Base station communicate with V to adjust distance & velocity
end
End
END

SCENERIOS FOR PROPOSED VEHICLE COLLISION AVOIDANCE SYSTEM

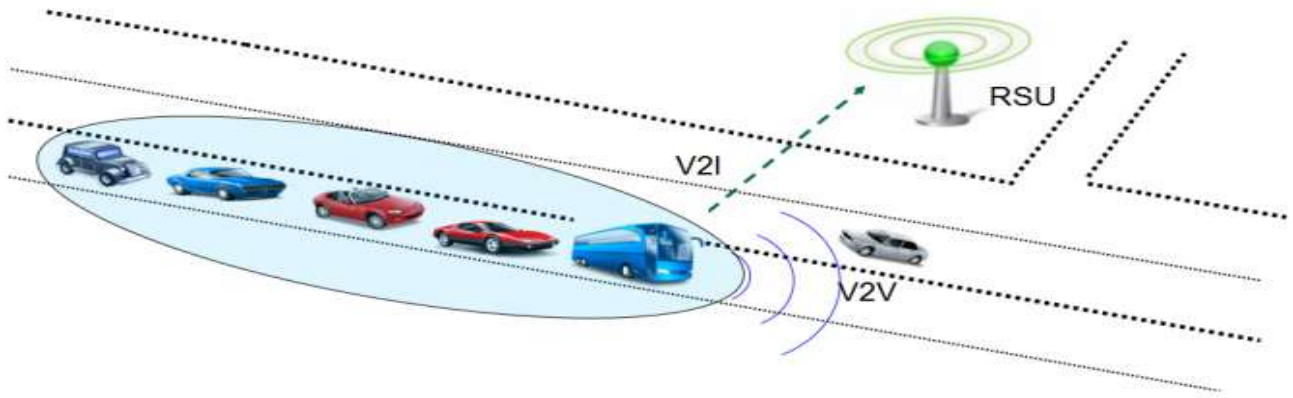


Figure 5: A Platoon of Vehicles

We know that there is an increase in accident ratio day by day. Due to this, safety becomes a critical chapter in every one's life. There are large number of vehicles move on the roads daily. A lot of accident occurs due to different reasons. There is a road sign provided in every areas still these are unpredictable and cause dangerous situations sometimes. In our work, it helps to reduce vehicle collision on roadside with the help of internet. It provides the usage of latest technology for reducing such kind of things on roads. It provides the alert to driver so that it may help to control its speed or maintain a distance from other vehicles.

In first case, it considers the single lane to move the vehicles on both sides. Due to this, accident may happen in large numbers. But due to presence of smart technology in vehicles, it helps to reduce accidents. In this case, if distance between vehicles are less or they are just close to each other for creating an accident, the driver receives a alert message immediately to reconfigure its distance and also maintain its velocity that helps to avoid accident.

In this work, it uses fuzzy controller to maintain its movement. The base station is provided in each corner of street or roadside to provide signals to the drivers. It helps to control distance from both sides and also controls velocity of both vehicles. Each vehicle has inbuilt circuit or sensor elements that helps to reduce collision with other vehicles. One sensor is used to locate its current location, other sensor helps to identify Closeby bodies, one is to increase or decrease its velocity etc.

In second case, more than 2 vehicles are moving in same lane. Due to this, they can collide with each other. But with the use of smart IOT technology, they never collide with each other. They will maintain a minimum distance between them so that collision never occurs. The sensors identify the location of other vehicles to maintain its velocity. All cases have main objective to reduce collision and helps to stop accident on roads. In next case, vehicles are moving in separate lanes so their speed is also fast. It can cause an accident to them. But smart technology helps to maintain accident free environment.

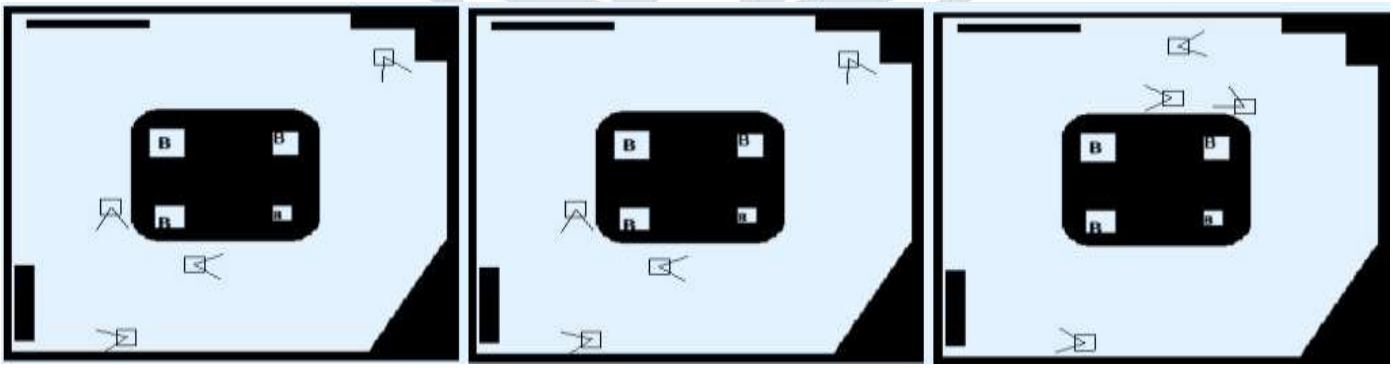


Fig 6: Automobile Controlling in Opposite Direction using IOT

The membership function used here is to describe all related data that contained in fuzzy sets. This function helps to describe special attributes and also provide the desired response of system. In this work, it provides a smooth range lies between 0 & 1. The input space is called sample of discourse. For this, it provides an output mapping corresponding to the input values. It uses a trapezoidal membership function for providing speed and distance response of system. Other membership functions did not able to specify asymmetrical membership functions. This function has flat top and trimmed triangular shape. It is used because of its simplicity. The core and support are the part of membership function. Core contains µA ~(x) = 1 and support contains µA ~(x) >0.

A portion of the fuzzy control rules are actuated by the data procured by the vehicle utilizing vision sensor. The yields of the actuated principles are weighted by fuzzy thinking and the speeds of the back driving wheels of the vehicle are ascertained. Speed of left & right wheels are meant as left-velocity (LV) and right-velocity (RV) individually. Etymological factors like "quick"; "medium" and "moderate" are characterized for left wheel speed and right wheel speed for enrollment work. Terms like "moderate", "moderate", "medium", "quick", and "quick" are considered for Speed of left & right wheels for enrollment works as appeared.

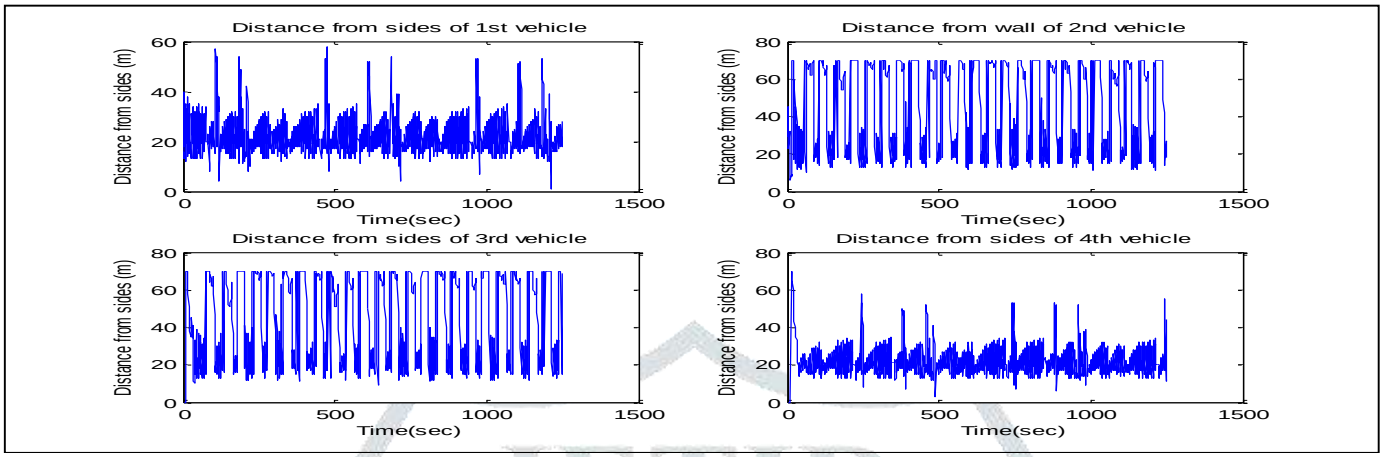


Fig 7: Distance Controlling & Estimation of all Four Vehicles

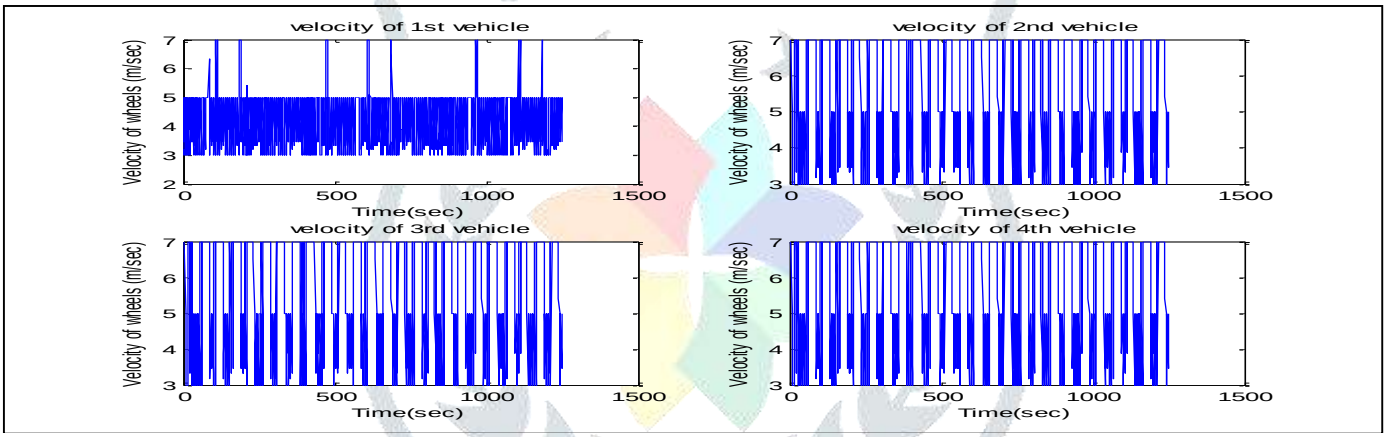


Fig 8: Velocity Controlling & Estimation of all Four Vehicles

III. CONCLUSION

Communication between different vehicles provides a better driving situation on the roads. It provides a better security for drivers to move on without tension or miss-happening. Safety of driver is crucial in today's technology era. Life is going very fast and all are quite busy in their life. No one has a time to wait for some time. Due to this, technology becomes so much advanced that helps to provide relaxation to drivers. There is development of Vehicular Ad-Hoc Networks technology that provides security to the drivers. Due to this, this work proposes a vehicle collision handling system in rural areas. It provides the controlling of vehicle movement by the use of internet. Internet helps to control the velocity of vehicles by providing signals of Close by vehicle and also maintains a distance between them. Different scenarios are studied and implemented. Different parameters like speed and distance are to be taken care off. It provides usefulness in terms of today's technology. The future work includes presence of obstacles in the path and also us of ABS system in vehicles.

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