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For Safety Applications: Intelligent Transport System (ITS)

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ABSTRACT: Connected vehicle innovation expect to fathom a portion of the greatest difficulties in the transportation in the territories of wellbeing, versatility and environment. The security application for Intelligent Transport System (ITS) is one of the principle destinations in this Paper we concentrate on V2V correspondence, once autos are associated which can impart information to different autos out and about and which lessen Highway mischances. At last, vehicles are interface by means of different corresponding advancements of vehicle to-vehicle (V2V) and vehicle-to-infrastructure (V2I) network in view of Wi-Fi, Dedicated Short Range Communication (DSRC)/WAVE remote media to intermittently show their position data alongside the driving goals as they approach crossing points. We give a reasonable examination of the VANET topology attributes after some time and space (Collision Detection) for a parkway and convergence situation to coordinate true street topology and continuous information separated from the interstate Performance Measurement System (PeMS) database into a tiny versatility model to create sensible movement streams along the roadway. Additionally gives Collision Detection Algorithm, SSM/TEM/TEMA model to enhance throughput at intersection focuses. In this paper we examine the utilization of vehicle-to-vehicle (V2V) correspondences by utilizing aforementioned calculations and models. To understand the concept of project I have implemented hardware by using AVR microcontroller.

KEYWORDS*:* ITS, V2V, DSRC WAVE wireless media, VA NET, Collision Detection Algorithm, SSM/TEM/TEMA ,AVR Microcontroller, Sensor, Xbee module.

I.INTRODUCTION

Concerning this savvy vehicle system, automobile commercial ventures everywhere throughout the world endeavored to present shrewd vehicle correspondence models. Another vehicle includes that make conceivable the trading of data with the web by means of particular interface will diminish the mishaps. So for this reason Vehicular Ad-Hoc Network otherwise called VANET.[1] Can be utilized to enhance activity conditions. these systems are portrayed by exceedingly dynamic topologies because of the quick versatility of the vehicles and their confined movements to geological example of high ways. Subsequently, VANET encounters correspondence irregularity all the more much of the time contrasted and customary Ad-Hoc Networks.

DSRC that is committed short range correspondence is one of the essential element with respect to the Intelligent Transport System (ITS)[13]. This DSRC is the wi-fi radio whose data transmission totally devoted for vehicles use. The DSRC gives us remote connections between Road-Side Equipment (RSE) and Onboard Equipment (OBE).

In view of the measurements gathered from on Federal Highway Administration (FHWA), an essentially high number of vehicle accidents happen at crossing points which are as of now overseen by stop signs and activity lights[2]. We will probably upgrade security while diminishing the postponement presented by stop signs or movement lights by utilizing our V2V-based crossing point administration conventions. Vehicle-to-Infrastructure (V2I) correspondence is a methodology that has been utilized to address the crossing point issue in earlier work in this area. As the word framework infers, the framework for the most part comprises of a smart and intense computational and communicational unit which would be introduced at every crossing point to impartsmart and intense computational and

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communicational unit which would be introduced at every crossing point to impart with every single drawing closer vehicle and oversee movement by saving a protected time-space entry through the crossing point for every vehicle. This methodology is not extremely reasonable as a result of the high cost and latency of introducing the convergence supervisor at every crossing point [6]. Another disadvantage of such a unified framework is, to the point that if the convergence administrator falls flat, crossing the convergence could be disorganized and perilous, like sign breakdown at a bustling convergence. Our centre in this Paper is to (an) enhance our V2V-based crossing point administration convention and present another impact location calculation for convergences [8] (b)extend a propelled versatility test system for vehicles and explore the utilization of controller model to test the execution of our conventions under sensible driving conditions[9] and(c) think about the operational effectiveness of our enhanced convention with our past work and routine movement lights[3].The principle target of the proposed work is: Design Vehicle correspondence administration conventions utilizing vehicle-to vehicle correspondence to address canter issues of security. Examine execution of Traffic-Light model. Investigate execution of V2V-association model.

II.RELATED WORK

In [8], creator utilizes V2V correspondence, DSRC Technologies for to associate Vehicles by means of numerous correlative advancements for brilliant network. In [9], this paper presents, Importance of Realistic versatility models for VANET Simulation which is viewed as a standout amongst the most essential part in ITS. This paper gives The significance of picking a reasonable certifiable situation for exhibitions investigations of directing conventions in this sort of system so Comparative study between two portability models, versatility design generator for VANET. What's more, gives VANET, Mobility Model, Simulations, Real World, NS-2 and so on. In [1], this paper, creator gives the necessities to Realistic investigation of the VANET topology attributes after some time and space for an expressway situation. In [2], this paper presents Emergency message, wellbeing application, vehicular impromptu systems, stream hypothesis, auto crash to assessing the execution of crisis informing by means of remote CA frameworks.

In [3], creator presents strategy VANET Modeling Clustering Design Under Practical Traffic, Channel and Mobility Conditions for giving integrates the three imperative variables Eg.size and topographical range, versatility of vehicle into one .model. In [4], the DGPS-Based Vehicle-to-Vehicle Cooperative Collision Warning: Engineering Feasibility Viewpoints, To distinguish potential crashes gives Vehicle collision warning system (CWS).

In [5], this paper. Progress separation, log-typical conveyance, way misfortune model, likelihood dispersion, vehicular specially appointed net-works (VANETs), remote correspondence, To explore the likelihood appropriation gives Realistic radio transmission model and a sensible likelihood circulation model. In [6], this paper, creator proposes a strategy based A guide free crossing point crash cautioning framework for all street designs for Estimator, convergence impact cautioning, outline, hand-off, relentless state driving. After studying all the above papers I have implemented my own conceptual a hardware to demo purpose. In this hardware messaging communication is used this messages are “Don’t Turn” and “Go Slow” which are helpful to decide proper time consuming road in the intersection of road to reach Destination place or intersection.

III.SYSTEM DESIGN

Stage1:The Design a smart vehicle to vehicle communication model

In this section we describe the three models: the Stop-Sign Model, the Throughput-Enhancement Model and Throughput-Enhancement Model with Agreement. We will specify their functionality under the various scenarios considering vehicle communicate at any intersection point.

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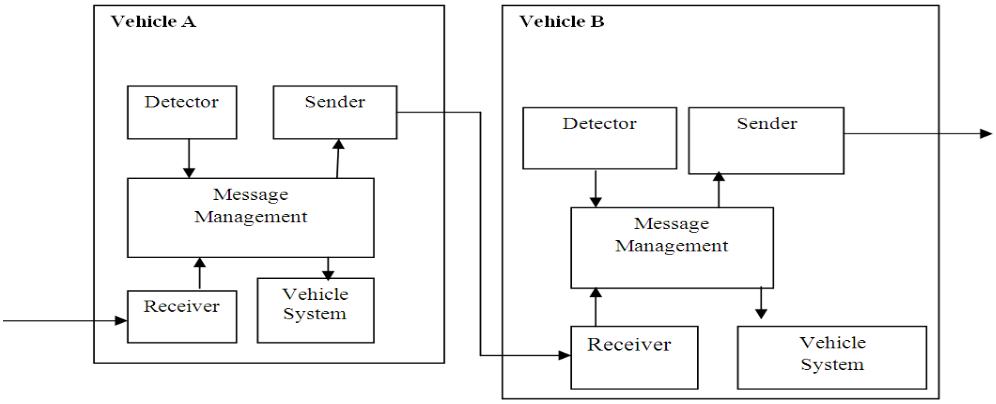

Fig. 1 Design A Smart Vehicle To Vehicle Communication Model

A. Stop-Sign Model (SSM):

In this model, Vehicles use STOP and CLEAR safety messages to inform other vehicles in range about their current situation and movement parameters.

B. Throughput Enhancement Model (TEM):

This model is intended to V2V communication without t utilizing any infrastructure devices. The objective is to improve the throughput at crossing points without bringing on accident. Vehicles again utilize STOP and CLEAR security messages for communication.

C. Throughput Enhancement Model with Agreement (TEMA) :

This model is based on TEM and is totally intended to handle lost V2V messages. Additional CONFIRM and DENY messages are utilized to perform clear handshaking between vehicles approaching the same intersection .Every vehicle affirms its choice to cross the crossing point by sending a CONFIRM or DENY message.

Stage 2: Collision Detection

We first identify the conditions required for two or more vehicles to collide at an intersection. Suppose Arrival-Time is the time at which a vehicle arrives at an entrance of the intersection and Exit-Time is the time at which the vehicle exits the intersection area. If a vehicle enters an intersection while another vehicle is in the intersection area, their (Arrival-Time, Exit-Time) intervals must overlap. Two vehicles being inside the same intersection at the same time is a necessary, but not sufficient condition for a collision. In Figure 2(a), two vehicles are within the intersection at the same time but not occupying the same space.

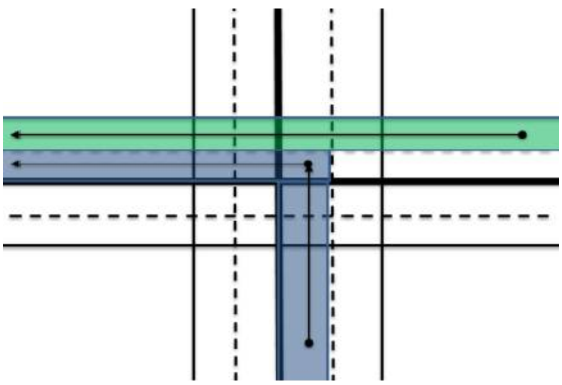

Figure.2(a)

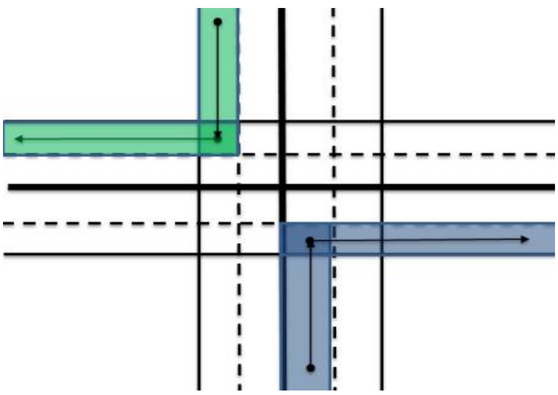

Figure.2(b)

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Figure 2(b) shows a scenario in which the any vehicle is coming from the south and turning right while other vehicle is coming from the north and also turning to its right. In this case, both vehicles can cross intersection at the same time without a collision.

collision occurs when following conditions are all true:

a. the Same Intersection: vehicles are at same intersection.

b. the Time Conflict: the vehicles have overlapping (Arrival-Time, Exit-Time) intervals.

c. the Space Conflict: the vehicles occupy same space while crossing the intersection.

If any one condition false in above three conditions, then there will be no collision and vehicles can safely continue along their trajectory. We refer to the part of the road that a vehicle is currently on as its current road segment, the part of the road that the vehicle will be moving to after the current road segment as the next road segment. In the context of an intersection, the CRS corresponds to the road segment that a vehicle is on before the intersection, and the NRS represents the road segment that the vehicle will be on after crossing the intersection.

Stage 3: Collision Detection Algorithm

In Our Collision Detection Algorithm for Intersections(CDAI) will be the run on each vehicle that crosses a transaction, with the information exchanged among vehicles approaching, crossing and leaving the intersection. algorithm uses path prediction to determine any space conflicts with other vehicles trying to cross intersection. Each lane on the road is considered to be as a polygon, which starts from the previous intersection and ends at the next approaching intersection. Then, the CDAI predicts the space (or region) which will be occupied by the vehicle during its trajectory. then Utilizing the current road segment, current lane, and next road segment information for each vehicle, CDAI predicts the path taken by the vehicle to cross the intersection and generates two polygons: the first polygon is related to the vehicle's CRS and current lane, and the second polygon is related to the vehicle's NRS. then the Each polygon's height is the length of the road between two consecutive intersections and the width of the polygon's is the lane width. So, for each vehicle, these two polygons together form the complete spatial region related to its path, which we refer to as its Trajectory Box (TB).

Stage 4: Mobility Model

This stage includes traffic light model:

Traffic-Light Model: The traffic-light model follows the same basic logic as the stop sign model except that stop signs are now replaced by traffic lights. The Red-Light Time of the traffic light has a default value that can be changed by the user.

Stage 5: V2V communication model

Gigahertz DSRC is a short-to-medium-range communications service that supports both public safety and private operations in v2r and v2v environments. the DSRC v2r links must support very high data transfer rates. the DSRC is multi-channel wireless protocol used in the VANET use which is based on IEEE 802.11a's Physical Layer and the IEEE 802.11's MAC Layer. This is designed to help drivers travel more safely and reduce the number of losses due to road accidents. In this experiment we used IEEE 802.11 medium access control (MAC), which uses carrier sense multiple accesses with collision avoidance. It operates over a 75MHz licensed spectrum in 5.9 GHz band allocated by the Federal Communications Commission and supports low latency vehicle-to-vehicle and vehicle-to-infrastructure communications. It provides the wireless link between Road Side Equipment and On board Equipment.

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IV. PROPOSED FLOWCHART

The Sequential performance of models and algorithms provides the final output in the NS2 simulation is as shown in following flow chart figure:

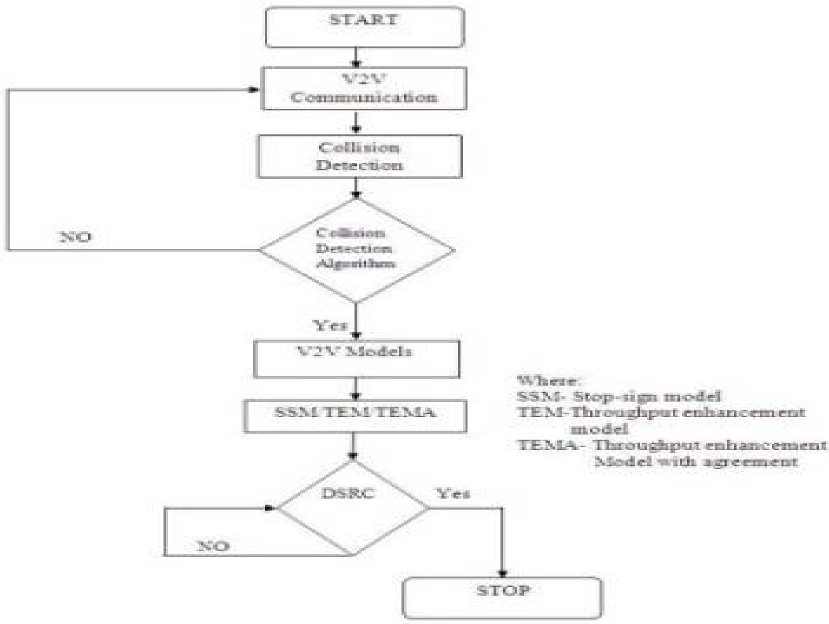

Fig. 3 Proposed Flowchart

V. VANET SIMULATION

In the V2V conventions we utilize VANET(Vehicular Ad hoc systems) for this reenactment. The principle highlight of VA NET is correspondence between two vehicles for message trade by means of Vehicle-to-Vehicle (V2V) and vehicle-to-Infrastructure (V2I) correspondence conventions. VANET is a term used to portray the unconstrained impromptu system shaped over vehicles proceeding onward the roadway. More in subtle element, VANETs are described by high portability, quickly evolving topology, and transient, one-time communications. VANETS are considered as a standout amongst the most surely understood innovations for enhancing the wellbeing applications and in addition vehicle productivity of shrewd transportation frameworks. Applications for VANETs are situated to wellbeing issues of vehicles so as to enhance the nature of transportation through time-basic security and activity administration applications. VANET nodes can sense a variety of data in its surrounding area to offer several services including traffic monitoring, speed controlling, lost vehicle locating and environmental monitoring as it covers permanently a wide geographical region. Nodes are configured with different communication. Vehicles moves within the specified network boundary. Nodes in VANET can communicate in two ways: vehicle-to-vehicle (V2V) communication and Vehicle-to-infrastructure (V2I) communication. In V2I communication model, vehicles communicate to Road-Side-Unit (RSU) through Road-Side-Routers. Data Transmission is established between nodes using UDP agent and CBR traffic. The sample 19.tcl designs a VANET with sensor node configuration, communication model, mobility model, and energy model components.

VI. NS2 SIMULATON

Ad hoc On Demand Distance Vector is the reactive protocol that does route discover When needed by a node. the route discovery process is initiated only when a the source node has data traffic to send to the any destination node, that makes AODV truly On- Demand routing protocol. In ns2 simulations, we chose to AODV since it behaves well in the several of the performance evaluations of the routing protocols The ns-2 code used in our simulations of AODV

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was obtained from. Each simulation run lasted for steps of msec. then with a uniform block size of 500 x 500 meters; the maximum speed of vehicles is of 40 m/s.

The number of vehicles nodes are 17. i have choose the traffic sources at a constant rate Constant Bit Rate. the Traffic between nodes is generated using a traffic generator which is characterized by the following parameters: Data packets Size is 512 bytes, the Interval between packets is 0.25s , the maximum of packets transmitted 1000. All nodes use the IEEE 802.11 MAC operating at 2Mbps speed. in The propagation model employed in the simulation is 2-Ray Ground reflection. With the use of NS2 platform I have used PCL-830 editor and NAM Complier in the ns2 simulation.

Simulation Performance: After the performance of NS2 simulation by using commands the result is shown as

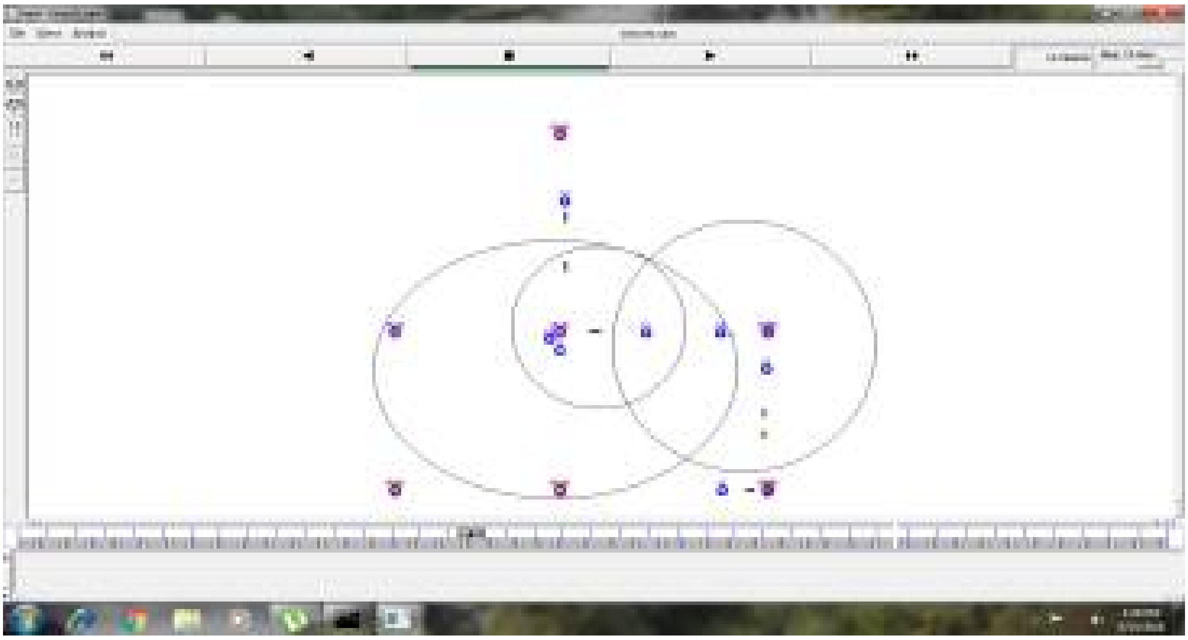
:


Fig 4. Simulation Performance

VII. HARDWARE DESIGN DIAGRAM

A. Block Diagram

The Block diagram of system hardware design contains power supply, X Bee module,Antenna,Max232,LCD display, AVR Microcontroller, four Obstacle detection sensors shown in figure bellow:

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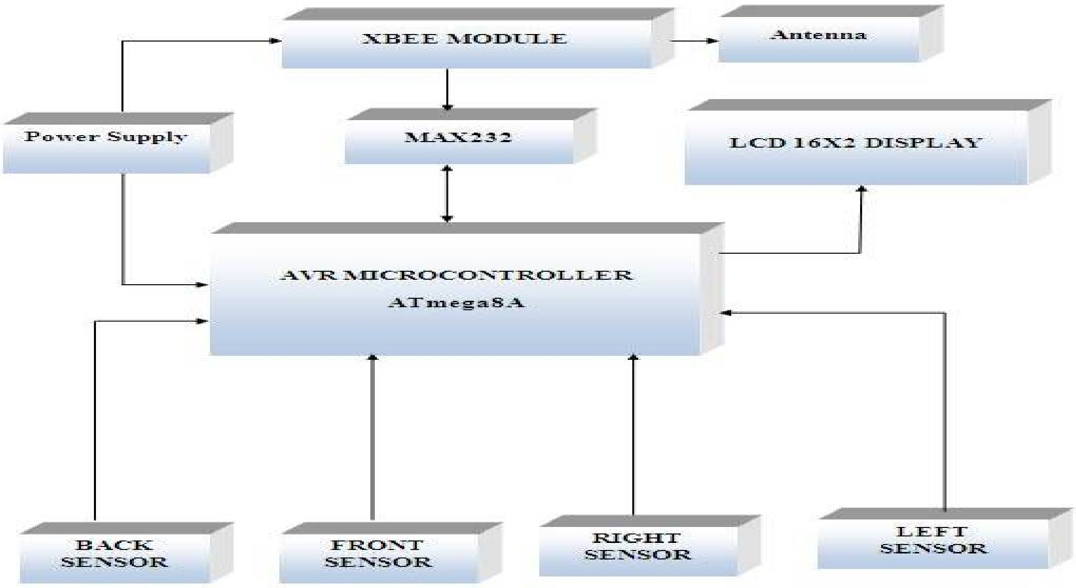

Fig.5. Block Diagram

B. Circuit Diagram

The circuit Diagram to implement the hardware by using interfacing AVR microcontroller with Xbee module and MAX 232 is as shown in figure bellow:

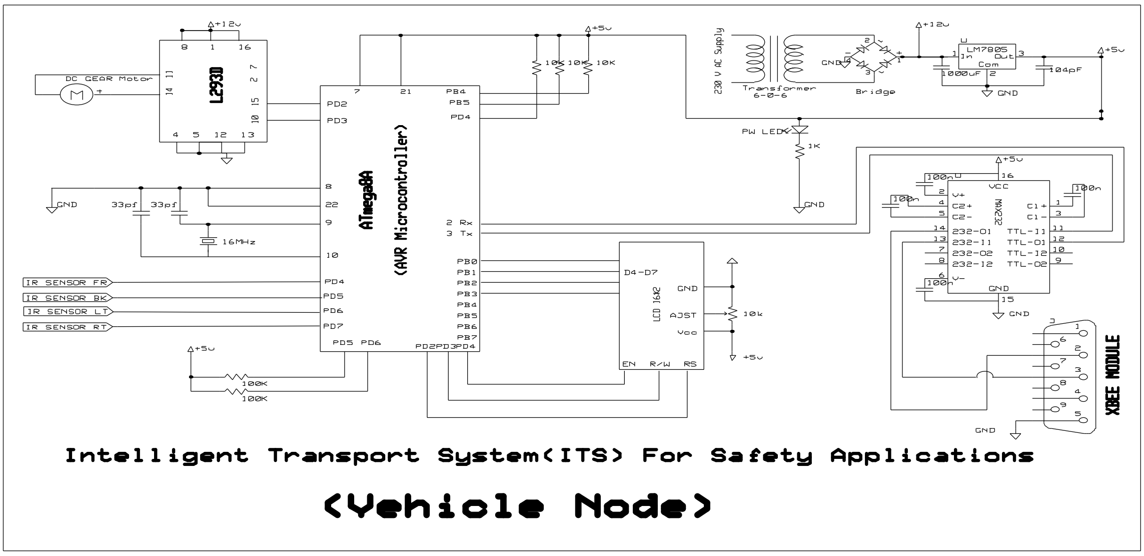

Fig.6 Circuit Diagram

C. Block Description:

AVR Microcontroller:

AVR Microcontroller is used as main control & Decision element. This is an 8-bit Microcontroller with 8K Bytes In-System Programmable Flash

- High-performance, Low-power AVR® 8-bit Microcontroller

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- Advanced RISC Architecture
- 130 Powerful Instructions – Most Single-clock Cycle Execution
- 32 x 8 General Purpose Working Registers
- Fully Static Operation Up to 16 MIPS Throughput at 16 MHz
- On-chip 2-cycle Multiplier
- High Endurance Non-volatile Memory segments
- 8K Bytes of In-System Self-programmable Flash program memory
- 512 Bytes EEPROM
- 1K Byte Internal SRAM
- Write/Erase Cycles: 10,000 Flash/100,000 EEPROM
- Data retention: 20 years at 85°C/100 years at 25°C(1)
- Optional Boot Code Section with Independent Lock Bits
- In-System Programming by On-chip Boot Program

True Read-While-Write Operation
– Programming Lock for Software Security

GSM Module:

GSM Module (SIM300) is used to send & receive the SMS from/to user.It is an AT command supportable serial communication module with 9600 default band rate. It work over the band of 900MHz to 1800MHz

GPS Module:

GPS module is used to get the current positions in the form of longitude & latitude in band rate of 9600.

MAX232:

It is an logic level convertor & it convert TTL logic to 232 & vice versa. It is used to interface microcontroller with GSM & GPS.

Motor Driver (L293D):

L293D is bidirectional Dual Pair motor Driver. Single IC can drive four motor unidirectional &two bi directional. Its operate on +5 V & Switch the 12V with maximum 2A current.

Motor (12V DC, 1/2 kg Torque):
12V DC permanent magnet motor with torque of 1/2kg & 30 RPM is used.

- Voltage:12V DC
- Current:250mA
- RPM:30
- Torque:1/2kg

Power Supply:

In the power supply unit following stage are require:
Step Down Transformer (230v AC to 12-0 AC):
Rectifier (Bridge):
Filter (Capacitor):
Regulator (7805):

Here we use +5V & +12V DC supply

IR Sensor :

IR LED is used as IR transmitter which is connected to output of 555 timer which generate 38KHz frequency and TSOP1738 is used as IR receiver which is low when signal is present.(i.e. Acive Low Sensor). So, the output of

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TSOP1738 is low when reflected signal is present(i.e. Obstacle is Present).Similar circuit of obstacle detector are as follow:

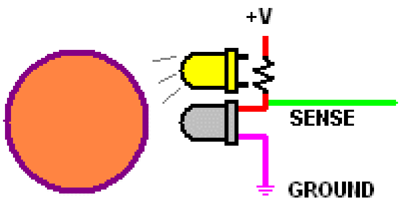

Fig7. Obstacle detector

VIII. HARDWARE IMPLEMENTATION

For demo purpose I have implemented this hardware. this works as both transmitter and receiver that is two nodes. Shown in figure bellow:

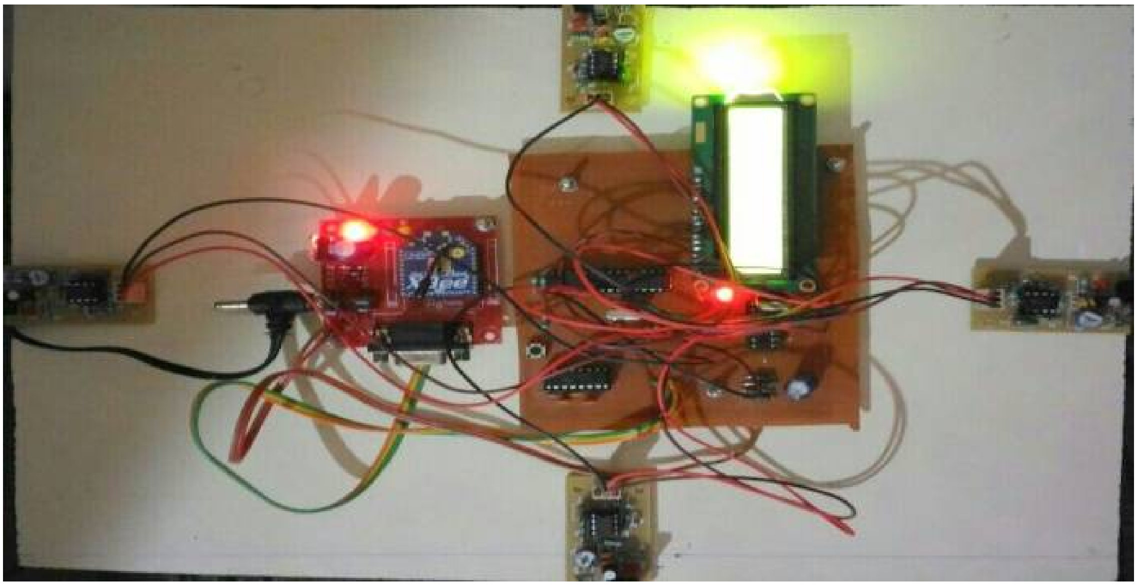

Fig.8 Works as Transmitting / Receiver Node

IX. HARDWARE RESULTS

Vehicles here only two nodes transmitter and receiver are for the demo purpose. Suppose at the intersection of road vehicle senses the traffic from left side of the intersection then at transmitting vehicle the system will displays the message as

Fig.9 At transmitter side when traffic from left side.

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Receiver receives the message as:

Fig.10 At receiver side when traffic from Left side

the output results when traffic from right side then transmitting vehicle displays the message as:

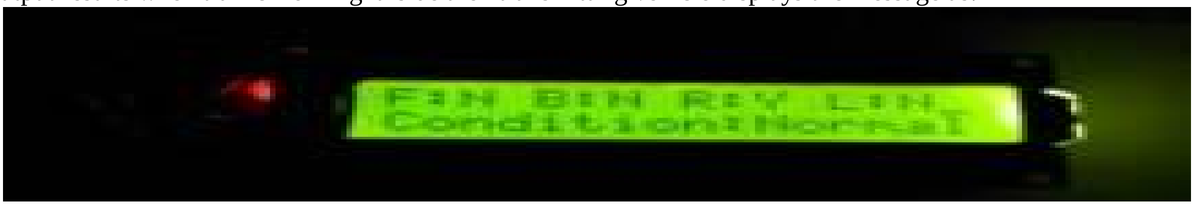

Fig.11 At transmitter side when traffic from Right side

then at the same time receiver receives the message as R=Y and Don't Turn as shown in figure bellow:

Fig.12 At receiver side when traffic from Right side

When traffic from front side and back side of the current vehicle then Transmitting side and Receiving side both are displays the messages are as shown in figure bellow:

Fig.13 At transmitter when traffic from front side

Fig.14 At receiver when traffic from front side

Fig.15 At transmitter when traffic from Back side

Fig.16 At receiver when traffic from back side

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X. CONCLUSION

Proposed to design Vehicle communication management protocols using vehicle-to-vehicle communication to address these core issues of safety. I believe that accidents can be diminished and endured altogether utilizing V2V technology. Since installation of wireless environment at every cross point would be costly. A V2V-based methodology appears to be more reasonable for implementing. I have depicted V2V-based conventions to be specific Stop-Sign, Traffic-Light, Throughput-Enhancement and Throughput-Enhancement with Agreement conventions VANET test system to backing these conventions.Results indicate the potential of these new V2V-based protocols to manage intersections with minimal dependency on infrastructure. Although our protocols are designed for autonomous vehicles that use V2V communication for co-operative driving, they can be adapted to a driver-alert system for manual vehicles at traffic intersections.

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