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An Advanced Automatic Prior Notification of Locomotives And Its Steering Conditions

K.Jonah Ravi*, R.China Appala Naidu**
**Student In M.Tech, Cse Department*
***Associate Professor, Cse Department*
St Martins Engineering College – Dhulapally
Hyderabad,Telangana, India-500014

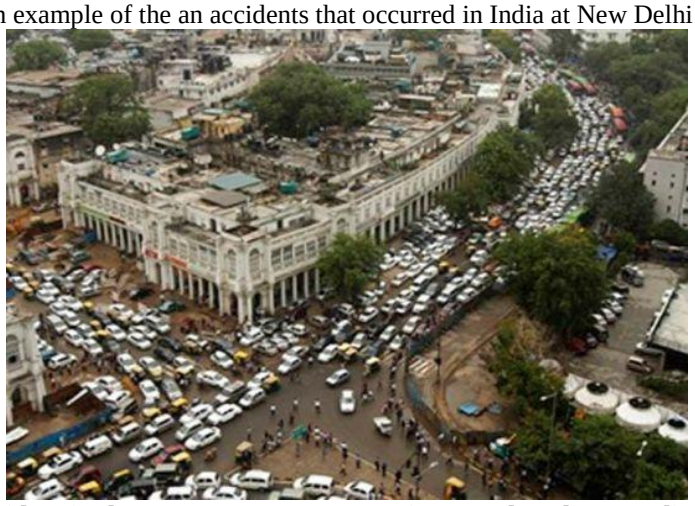
Abstract: *The previous papers produced a study on the estimation of the post accident scenarios, their solution either record commercial or beneficial to authorities. In this paper we work on the pre notification which helps in the reduction of the extreme impacts of the mishap/vehicle collision. This pre notification is calculated in concern with both the distinct on the steering as well as the vehicle. This paper can play an important role in the advancement of the intelligent system of the chore automotives. The previous paper study has been focusing on the naval scenarios, fleet management. In this paper, we propose a safety not only in terms of the road risks but also on an individual's intoxication by using health sensors, we have developed this idea on the reference of PBHR base paper to bring an advancement in the prior notification of the driver's health condition.*
Keywords*:Accident assistance, GPS communications, ZIGBEE, PCB board, Pressure sensor, Smell* sensor.

I. Introduction:

During the last few centuries the growth in the automotive vehicles is increasing gradually as a primary means of transport .As there is an increase in traffic there is also a proportionate increase in the road fatalities .The frequency of the collision in India is the most highest in the world. According to the National Crime Record Bureau (NCRB) reports reveals that every year more than 1,35,000 traffic collision deaths occurs in India . Top 10 cities with highest number of road crash deaths rank wise given by NDTV

1. DELHI
2. CHENNAI
3. JAIPUR
4.BANGLORE
5.MUMBAI
6. KANPUR
7. LUCKNOW
8. AGRA
9. HYDERABAD
10. PUNE.

The rate of accidents estimated is 13 per hour in 2013 and nearing to 15 per hour in 2014
The below diagram is an example of the an accidents that occurred in India at New Delhi in the year 2013



One serious road accident in the country occurs every minute and 16 die on Indian roads every hour .

To reduce the no of roads fatalities, in this paper we develop a prototype in which we integrate sensors GPS along with the terms of safety for the near generations. By using a mobile intelligence system. Estimating the required actions on the situation can be handy rather than using manual decision which should be incomplete and accurate the assistant given by the intelligence system will help the emergency services to adopt man and material resources to the condition of the accident.

Problems in the existing system:-

As previously mentioned at the sight of the accident many manual decisions at the time of accidents taken by the emergency services may be inaccurate and incomplete data on the condition of the accidents. By the information sketched from the data various teams arrive at the accident location without knowing what type of accident occurred as well as the severity cannot be estimated.

Problems:- 1. Time taken by the rescue operation is more.

2. Resources may be wasted unknowingly.
3. Accurate prediction based on severity cannot be predicted.

According to the proposed system in this approach we can directly estimate the severity of accidents by comparing the data obtained from the integrated On Board Unit (OBU) of the vehicle. The information is collected when the accident occurs which is captured by the sensors installed on the On Board Unit (OBU) of the vehicle. By the information obtained it also helps in estimating the severity immediately. Merits obtained from this prototype fast and accurate estimation of accident, reduce number of road fatalities, reduces the wastages of resources. The main components present in the project are

1. Sensors
2. GPS
3. Microcontroller
4. Regulated power supply

Our project estimates the current status of the vehicle if in case of collusion. The GPS based technology helps to communicate to the operators above the mal functioning of the car with the exact date and time along with its location. Apart from this an Short Message Service (SMS) can also be sent easily about the remote location through satellite communication.

The application of the project deals with the vehicle tracking monitoring the location of the fatality, driver behaviour in case of drunk.

In this paper we collect the precise information about the road accident that is used to estimate the severity of the collision and improving the post collision assistance.

II. Research Methodologies:

In our approach we collect information about the road accident which occurs by the below architecture.

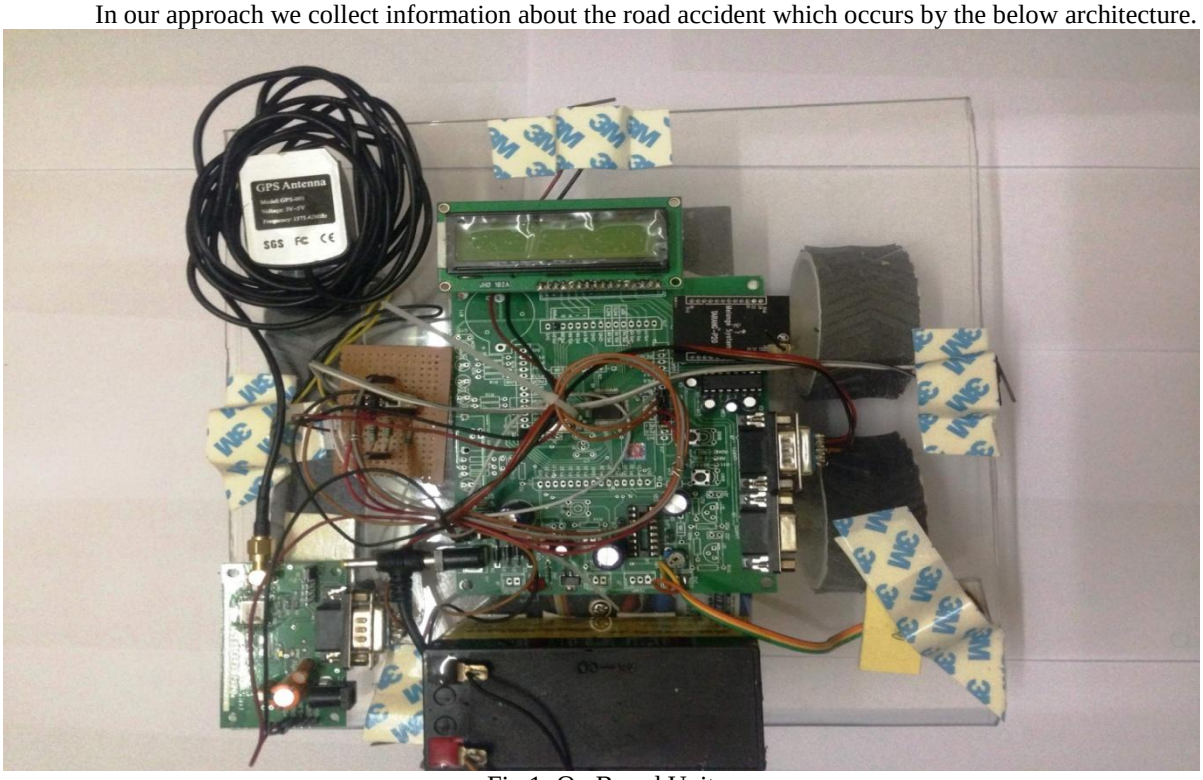


Fig 1: On Board Unit

ONBOARD UNIT

This is the picture captured of On Board Unit (OBU) which is responsible for detecting the potential impact, collecting information send from sensors and also handling the situation through a warning notification. This On Board Unit (OBU) is a collection of various entities described below.

Brief on On Board Unit

1. SENSORS

A. *Pressure Sensor :* The pressure sensors which are embedded in the On Board Unit (OBU) estimates the degree of crash severity. The pressure sensors characterized the severity of the crash and pass the information to the system module. The sensors compose micro machines, accelerometer, custom integrated circuit, microprocessor. The custom integrated circuit is designed to record the impact. The pressure sensors function on frontal, rare and sides.

i. *Frontal impact sensing :* - In the frontal impact the vehicle decelerates as the impact absorbs into the engine compartment. As the sensor placed in the front end the crash severity is estimated when the car front part would be damaged.

ii. *Rare impact sensing :* - In the rare impact as the vehicle is being collided from back the thrust of collision would be high. The rare sensors estimate the damage factor.

iii. *Side impact sensing :* - The distance between the interior and the exterior of the occupant is smaller comparatively to the front and rare end hence the intrusion of the crash is more near inside collision.

B. *Smell sensor :* - The MQ3 is the alcohol detecting sensor. It is high sensitive to alcohol and benzene. They respond fast, stable and long life. The MQ3 gas sensors are composed by micro aluminium trioxide ceramic tube, tin dioxide, measuring electrode. The crust is made up of plastic and stainless steel net. The MQ3 gas sensors has a special quality which is called sensitivity adjustment.

i. *Sensitivity adjustment :* - The resistance value of various kinds of concentrated gases is calibrated approximately to 0.4mg/L in air. On accurate measuring the alarm point of the gas sensor will be activated.

2. GPS (GLOBAL POSITIONING SYSTEM)

The vehicle health monitoring system using GPRS is a system in which GPS is made use of to detect the exact location of the vehicle in which the device is embedded. When a large number of objects or vehicles were spread all over the ground, the owner of corporation needs to keep track for fuel saving, security purposes…etc. A tracking system is required to determine the location of any object at any given time and the distance travelled. Also, the need for a tracking system in users vehicle is used to prevent any kind of theft since police can use tracking reports to locate a stolen vehicle location. GPRS and GPS based tracking system will provide effective, real time vehicle location report. As GPS and GPRS are used to trace the exact latitude and longitude co-ordinates of the vehicle which is emphasised by the geographical positioning through satellite pointing on the Google Maps.

The system uses an On-Vehicle Module consists of GPS receiver and GSM modem, the device resides in the vehicle to be tracked. The traced location by the GSM is transferred to the server by GPRS. Extensive research work had been carried in the field of object based system ranging from GSM based location determination to GPS based location determination. Initially the GPS co-ordinates where transferred using SMS module by the assimilation of GPS and GPRS. GPRS technology is an advancement in accessing the remote location.

GPS works on the satellite navigation system which is used to gather accurate information regarding to the location and time irrespective of the weather conditions. Anywhere, where there is no obstruction of sight in between three or more GPS satellites on or near the Earth .

GPS technology can be described in terms of three segments:

- Space Segment: Consists of twenty-four satellites orbiting 11,000 nautical miles above the earth.
- Control Segment: Consists of 5 ground stations around the globe that manage the operational health of the satellites by transmitting orbital corrections and clock updates.
- User Segment: Consists of various types of GPS receivers that can vary in complexity and sophistication.

GPS receivers are able to identify their location when three GPS satellites triangulate and measure the distance to the receiver and compare the measurements. A fourth satellite measures the time to the receiver. The information from all four satellites is compiled to determine the location. The sophistication of a GPS receiver impacts the reliability and accuracy of the GPS data received.

Fig 2: GPS

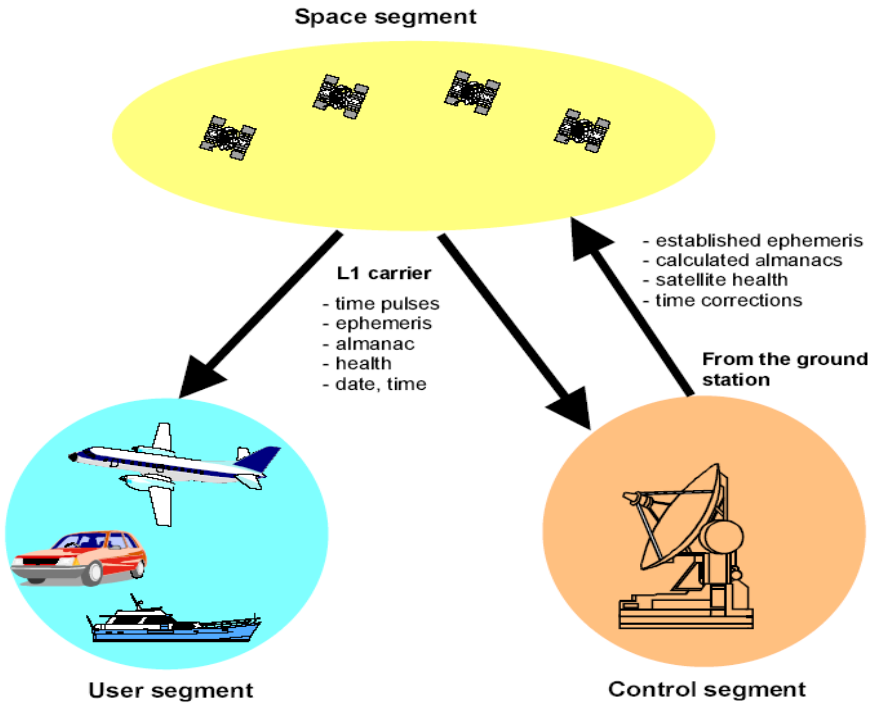


Fig 3: GPS communication module

3. MAX-232:

It is an interface which is serial and requires negative logic for the PC. The microcontroller pins Txd Rxd are used to convert TTl logics. MAX 232 acts as both receiver and transmitter depending upon the criteria with only a power supply of +5 volts. There are 4 levels of translators 2 are RS232 transmitters that converts TTL or CMOS inputs to RS232 outputs. The other 2 translators are RS receivers which converts the input generated from the transmitters to 5V. A MAX232 circuit is drawn below:

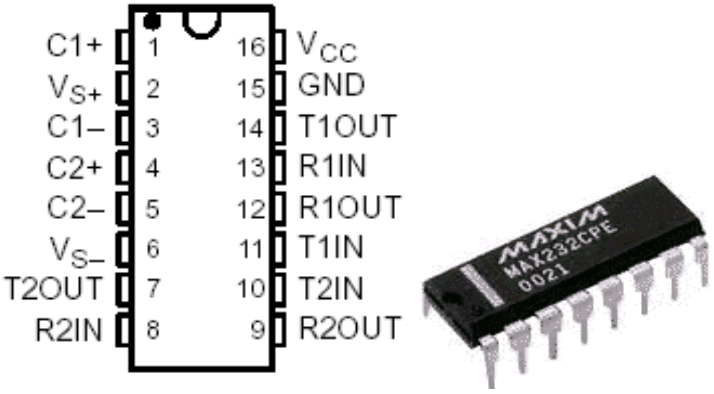


Fig 4: Pin configuration of MAX232

Features of MAX232:

1. The operations run with 5V power supply.
2. Current supply is low.
3. Meets or exceeds the recommendation of ITU and EIA232.
4. Interchangeable its design with maximum.
5. The process technology used is LinBiCMOS.

MAX232 chip is been used in uC boards for a long time. The logic 1 ranges from -3 volts to -12 volts and for logic 0 ranges from +3 to +12. Before soldering the board the polarity of the capacitors need to be checked carefully as there is no need of external capacitors. The circuit can be used without any problem. The circuit diagram of Max232

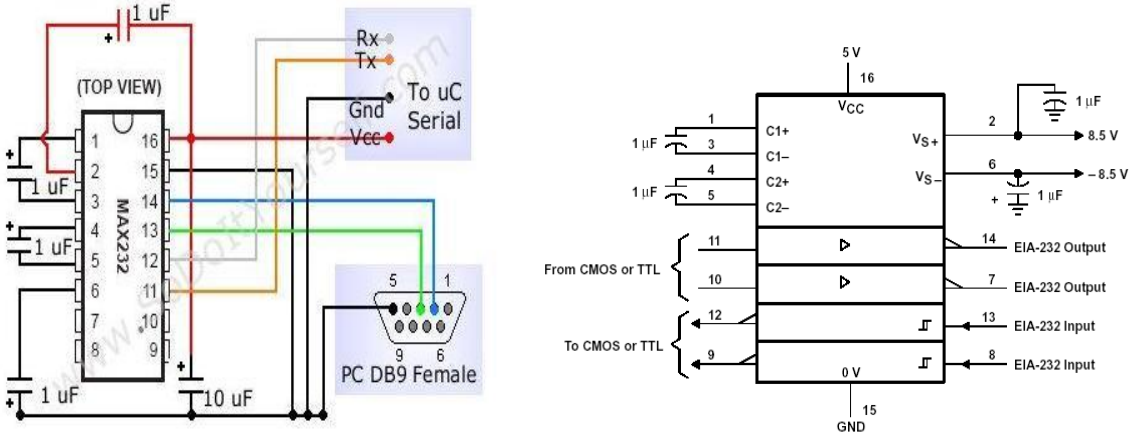


Fig 5: Circuit connection of MAX232

4. ARM7:

ARM7 is a microcontroller which is a real time embedded support with 16 or 32 bit. It has a high speed memory which ranges from 32 kilobyte to 512 kilobyte. The architecture interface has an unique accelerator which is 128 bit wide memory and the code executes with maximum bit rate. The interfaces of the serial communication ranges from full speed USB 2.0 device, UART's to I2C bus. The SRAM on the chip is a good communication gateway protocols providing a good power for processing as well as huge buffer size, SRAM is a device of 8kb to 40kb.

Features:

1. Real time clock is either independent of power or uses low power, with 32 kHz.
2. Its communication is a multiple serial interface.
3. The voltage range for operation in CPU is from 3V to 3.6V.
4. It has a high speed flash memory of 32kb to 512kb.
5. Execution of instruction is an real monitor software and high speed tracing through USB 2.0 full speed device.

APPLICATIONS

- Industrial control
- Medical systems
- Access control
- Point-of-sale
- Communication gateway
- Embedded soft modem
- General purpose application

Working of the OBU: The OBU has several functionalites

i. Detecting the potenyial impact of accidents
ii. Detecting the intoxication of the driver
iii. Collecting information generated from sensors'

When an impact / accident are occurred or when the driver is intoxicated the OBU communicate with control unit /admin through wifi or gps module. An information about the exact remote location is passed. This tends to be direct communication between the vehicle and emergency services.

Process:

Selection: the data is being collected from the sensors and send to the web service modules.

Pre Processing and transferring: the data is being pre-processed and analyzed for the correct data regarding the impact. This data is sent to the emergency services accordingly.

Evaluation: based on the received data from the web services modules the emergency services are acted on the accident with efficient resources.

5.BRIEF DESCRIPTION OF CAR MODEL: In are project we have also designed a remote controllable car, which works on zigbee. This car which has being designed can rotate over 360^{o} in direction and can weigh aroung 80 kgs .

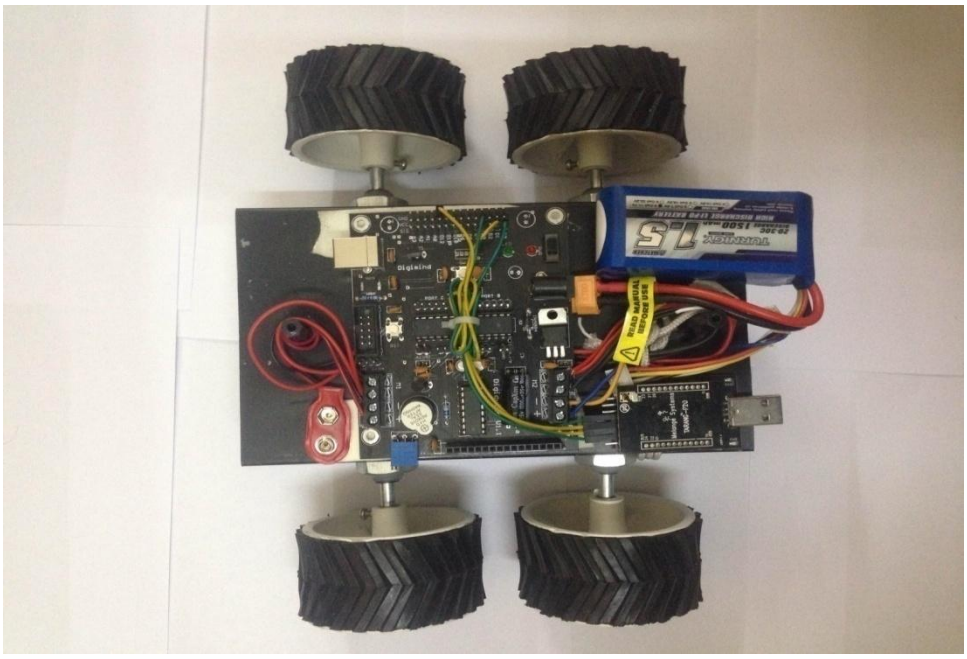


Fig 6: Robotic remote controlled car

It is being operated by the use an AVR series of microcontroller. The control movement commands such as left, right, forward and backward are sent to the microcontroller which is interfaced with four motors of which two are ARMS and the others are gripper for the movement in the robotic car. We use RF remote which is an RF transmitter controller in co-coordinating with the movement of the car, whose range is up to 200 meters with an efficient and a proper antenna. The commands are being decoded before it is being sent to another microcontroller to run the DC motors for required movement or work.

III. Results:

As we proposed in the above about the prior severity notification, we conducted few iterations depending upon the considerations of are factors like data collected from the pressure sensor and gas sensors.

We have also used the LCD screens on the on board. The below images present the iteration we conducted from are working model of the on board unit .

Fig 7: Web form Output

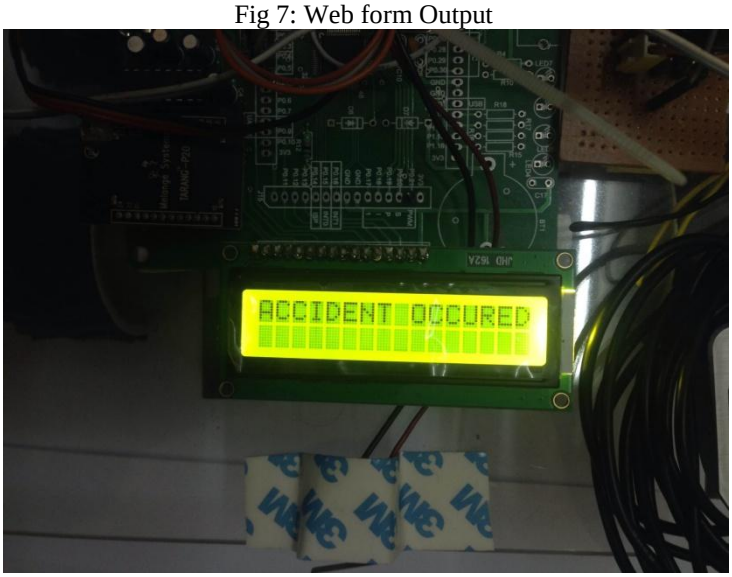


Fig 8: OBU LCD Output

IV. Data extracted from the pressure sensors

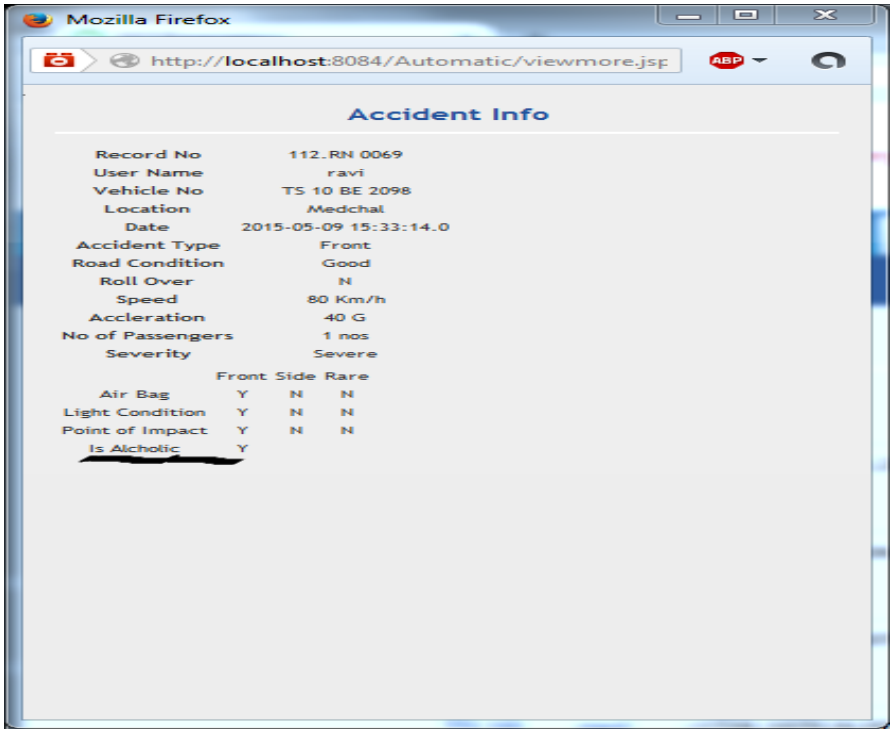


Fig 9: Web form Output for Alcohol detection

Fig 10: OBU LCD Output of Alcohol detection

Notification on alcoholic condition

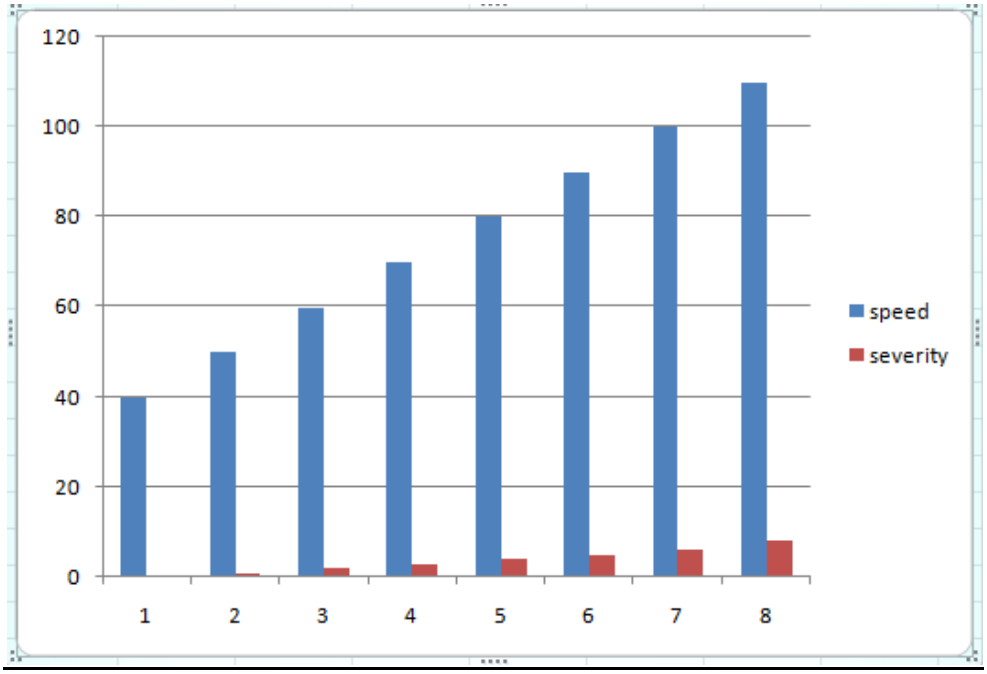


Fig 11: Graph on speed versus severity

Table 1: Speed on Severity

X-Axis (speed in kmph)	Y-Axis (severity)
40	2
50	4
60	5
70	7
80	8
90	9
100	10
110	11

Speed proportional to severity (as speed increases severity increases**)**

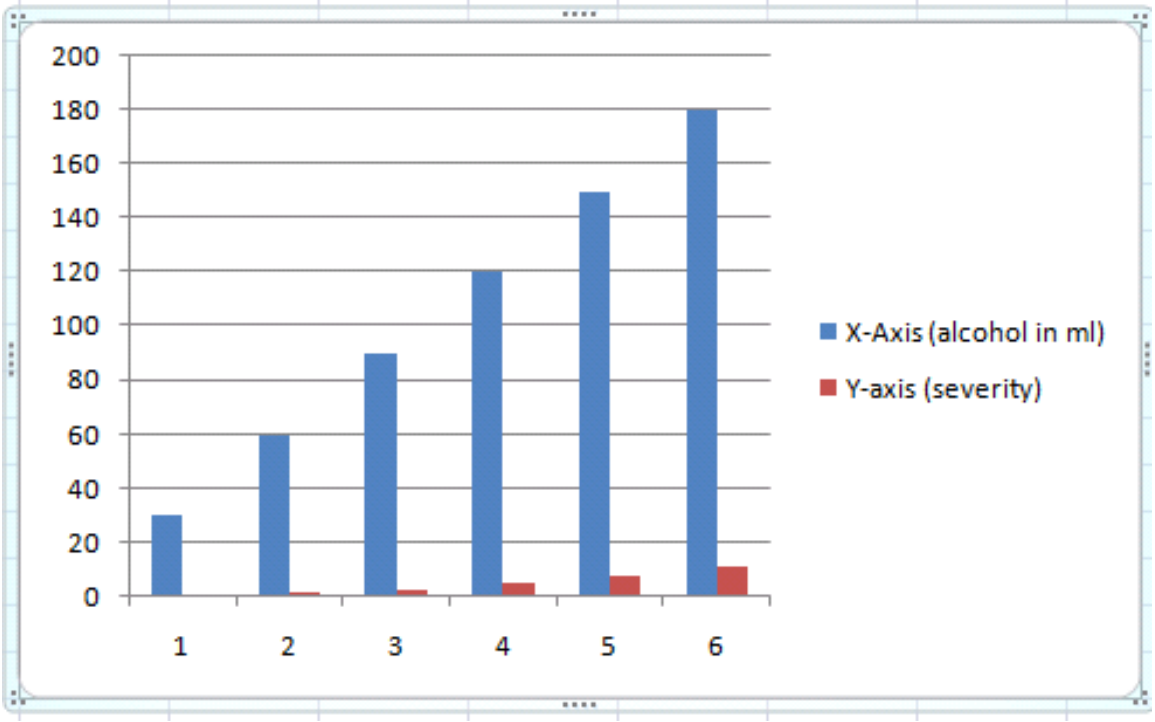


Fig 12: Graph on Alcohol intake verses severity

Table 2: Alcohol content on severity

X-Axis (alcohol in ml)	Y-axis (severity)
30	1
60	2
90	3
120	5
150	8
180	11

Amount of Intoxication is proportional to severity(as alcohol increase control loses)

Smell sensor Setting and Notification:

Table 3: Notification of sensor

Alcohol Intake (degree of smell)	Notification by Senor
600	MILD TOXICATED
800	MODRATELY TOXICATED
1000	HIGH TOXICATED

A graph predicted depending upon above table:

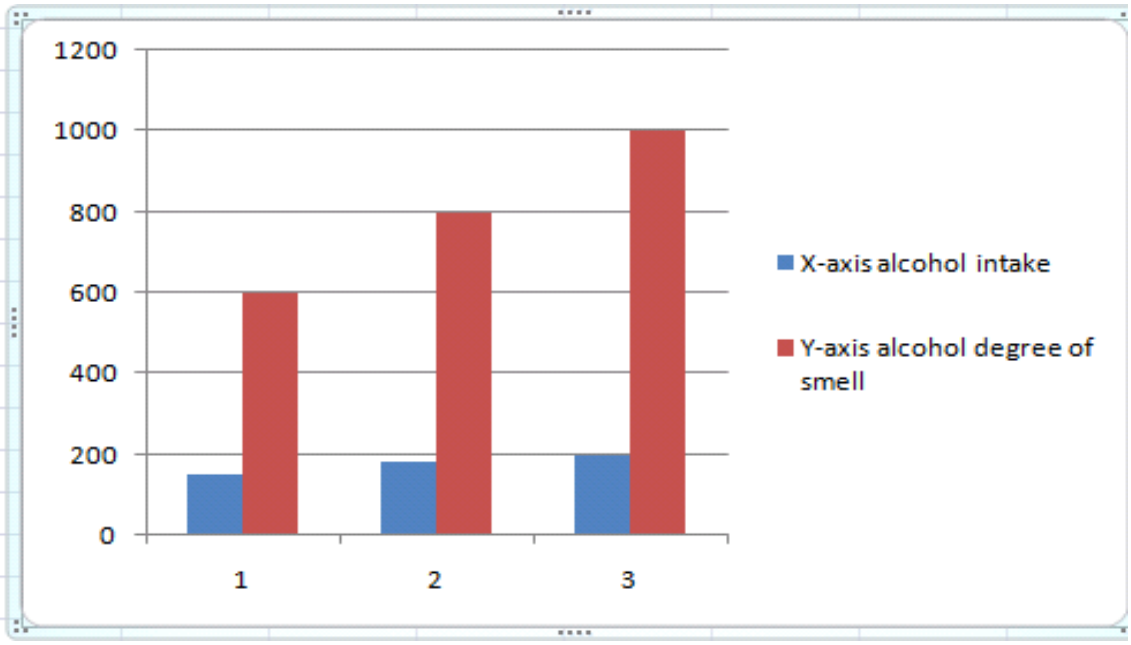


Fig13 : Graph on alcohol intake verse degree of smell notified

Table 4: Alcohol intake on alcohol degree of smell

X-axis alcohol intake	Y-axis alcohol degree of smell
150	600
180	800
200	1000

V. Conclusion:

The integration of new technologies in the sector of automobiles provides an assistance to the people for the reduction of accidents as well as adding an advantage to gather information regarding the pre accident consequence. The prototype which is designed improve the effectiveness to support the intelligent system to automate decision associated with accidents. The prior estimation of severity of an accident is required in order to prevent fatality on road. In are study we observe that vehicle speed is added as a main caution for the severity. The proposed paper added on to a beneficial and robust to deploy OBU On Board Unit into automotives for safety.

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