

# Real Time Accident Detection and Alerting System for Medical Emergency and Rescue

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*Abstract:* Our aim through this paper is to give a brief detail on the ways by which we can avoid the accident and detect the location of that accident which is based on previous parameters, and we can provide medicals as soon as possible. In this there are two possibilities as in the first one a pre accident detection system is there in which various techniques like alcohol sensor, eye blinking sensor etc. are applied to find out the accident prior to its occurrence so that we can avoid this. Secondly about the post alert system we use vibration sensor, accelerometer sensor etc. to detect the accident. When vibration threshold frequency exceeds the programmed maximum limit, then GPS data from the GPS module is extracted and later alerts the police and the rescue team about the tragedy to provide the medicals and other favorable help to that person. GPS & GSM systems track a vehicle and send the exact location of the vehicle as a text message.

*Keywords:* Vehicle, Accidents, Tragedy, Medical, Detection, Alert, Techniques, Location, Track, System, etc.

## I. INTRODUCTION

As the economy is increasing day by day, we can see the number of vehicles is also increasing at a faster rate. So, it is very obvious that road accidents will also increase, and the death rate will also increase. In this automobile sector especially, two-wheelers are increasing at the fastest rate. And according to the survey reports most of the deaths happen just because of the lack of immediate medical help on the expressway or a national highway.<sup>[2]</sup> So, in this idea our main aim is to target those victims to provide medical help as soon as possible. Thus comes the idea of an alerting system that captures the road accidents and its seriousness and alerts the nearest police station, rescue team and the

nearest hospital so that they can provide the ambulance and all other stuff at the accident area.<sup>[5]</sup> As the system sends the exact location of the accident area so there will be no delay by the help team, This system will also send messages to the friends and relatives to inform them about the incident.<sup>[2]</sup>

This system has been studied over the last many years. Many of the research teams are trying to execute this model which has basically three different modules. The very first one is to capture the person's location by GPS receiver and send all necessary details to the vehicle owner's phone number. Second one is proposed system offers automated detection and in the assistance of all passengers where they are involved in accidents with the help of v2v communication.<sup>[4]</sup> And the third one is sending the location of the victim to medical helpers which are nearby to that place. And this also senses the heartbeat of the victim to check the seriousness of the accident and it sends the same detail to the medical center.<sup>[3]</sup>

## II. PROBLEM DEFINITION

A good number of reports were studied on road accident and road accident deaths. These unfortunate deaths are a cause of just a single reason, that is to provide the required facility to the victim at the right place and at the right time. The measuring system which is based mostly on installation projected would inform the accident victim's relations or police room concerning the accident instantly, in order that facilitation to the slashed in road accident may be delivered as presently as attainable. The medical emergency care unit would dispatch to the accident location without any delay, thereby we are able to increase the victim's survival possibilities.<sup>[5]</sup>

### III. LITERATURE SURVEY

The system contains GPS, GSM module and Vibration sensor which will be activated by sudden or heavy vibration or triggered by the airbag system. We will use Bluetooth technology to activate GPS by the sensors. When an accident happens, the system operated in the vehicle will be activated by the sensors and information with the fixed location of the accident area. Messages will be sent to the number entered in the system and to the nearest police station, hospital, and rescue team.<sup>[1]</sup> The installed system will work when the vehicle is registered and uploaded in the database of PSO Headquarter. We have proposed a new system after studying various precious papers on the system. In this system work in two-part (a) Pre-Accident part (b) post-accident part. In the pre-accident phase we use two sensors, alcohol detection sensor and eye blinking detection sensor. Alcohol sensor detects if the person who is driving the car is drunk or not and an eye blinking sensor which will count the at what rate your eye is blinking if the sensor will find something abnormal is going so it will be going to stop the vehicle for the safety purpose.<sup>[6]</sup> In the post-accident phase we use four sensors, accelerometer sensor, vibration sensor, ultrasonic sensor and fire sensor. Accelerometer sensors respond where there is change in the speed and tilt in the vehicle. The accelerometer sensor is based on the finding of the gravitational forces in the system. The sensor senses the change in the gravitation-forces in the object. The value of the gravitation forces talks about the type of the collision. Vibration sensor detects the vibration of the vehicle and degree of vibration occurred on the vehicle. This sensor will activate when it crosses the threshold force defined in the system. Ultrasonic sensor detects the obstacles in the path before collision and alerts the driver. This will work with the vibration sensor to avoid false alarms.<sup>[7]</sup> Fire alarm will detect the fire in the vehicle after the accident. After checking all parameters, the system will activate and send the information to the family members, police station, ambulance, hospital with exact location with the help of two modules which are GPS and GSM installed in the system.<sup>[9]</sup>

### IV. SYSTEM IMPLEMENTATION

Overall implementation will be done in 2 phases, the software and the hardware implementation. All the software will be initially tested and hence the implementation architecture will be taken care of. Overall purpose is to meet the proposed objective.<sup>[8]</sup>

#### A. Software Implementation

This constitutes the fundamental aspect of the project. It has to be done very carefully. It determines the efficiency of the equipment, helps in selection criteria of the components

and the requirement of each component. In addition, the coding was done using Arduino software.<sup>[8]</sup>

#### B. Hardware Implementation

In the hardware implementation the following components briefly explained below were used to actualize the aim of our project.<sup>[8]</sup>

##### i. ARDUINO NANO

Arduino NANO is dependent on the Atmega328 microcontroller, and this is very small in size and it is a very friendly board. The main function of this Arduino is exactly like other boards but in different ways. And the drawback of the board is the port which is installed in this mini and which is replaced by a DC power jack.<sup>[7]</sup>



Fig.1. Arduino NANO

##### ii. GPS Module

The GPS module used here is a perfect module having a ceramic antenna and is basically a complete GPS receiver. It captures the location data of the affected vehicle and sends it to the microcontroller. Hence the location of the vehicle can be easily determined.<sup>[6]</sup>

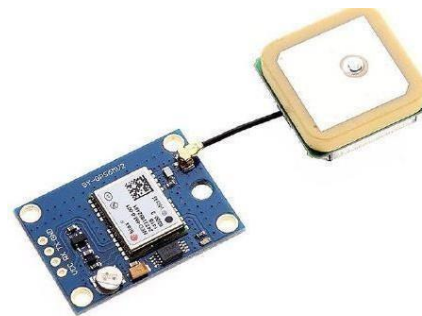


Fig.2. GPS Module

##### iii. GSM Module

In this module there is a SIM 900 GSM used which is connected with a microcontroller which helps to work many mobile functions examples are to conduct a call and messages. There is a shield which is designed to protect the SIM900 chip to

connect with any microcontroller for working. There are so many varieties of AT commands and the protection or shield will be free to send or receive any type of text or call. So there are some benefits of SIM 900 which makes it the perfect device to complete the aim of the project.<sup>[5]</sup>



Fig.3. GSM Module

iv. Accelerometer Sensor

An accelerometer sensor is used to detect the tilt angle. This sensor is a 3-axis sensor (MMA7660FC) which helps in finding different physical changes like tap, tilt and shake etc. It senses the activity in all the three directions, this property is its most dominating one. <sup>[1]</sup>



Fig.4. Accelerometer sensor



Fig.5. When vehicle position in x- axis



Fig.6. When vehicle position in y-axis



Fig.7. When vehicle position in z-axis

• VIBRATION SENSOR

The model's name of this sensor is SW18010p which is a vibration sensor having a spring mechanism and in which a small piece of metal is connected in the center of the dark part. So generally, when any outside force is applied then the spring touches the metal part and when force is

removed the both sides of the sensor get open. The number which comes after SW18 signifies the amount of force which is essential to come into the contact. So generally, when the high the number it means the greater the vibration is required to reach saturation point. In short, in this component this can be used to find out the vibration occurs and the seriousness of vibration that hits the automobile.<sup>[3]</sup>



Fig.8. Vibration Sensor

v. ULTRASONIC SENSOR

So the model name is HC-SRO4P Ultrasonic ranging which is a very low or moderate proximity sensor and the main role of this sensor is that it uses its sonar to measure the gap between the obstacles. In this there is an ultrasonic transmitter and the second one is fitted with receiver modules. So, the basic function is to send a signal or message which is just reflected whenever the signal module finds an obstacle. There is an echo pin which accepts the signal coming and in this the time gap between the transmission and receiver is used to find out its distance to the obstacle because its sound speed in the vacuum is known. An on-board 2.54mm pitch pin frontier granted it to be front face to any obstacle during its testing phase. So, with the use of this sensor in our project it

will mainly verify that there is any obstacle in front, back or side of the automobile and after finding it will alert with the help of an alarm to ignore any type of tragedy and generally it is connected with the vibration sensor.<sup>[2]</sup>



Fig.9. Ultrasonic Sensor

• ALCOHOL SENSOR

In this one the main function of this sensor is to find out whether the driver had consumed any type of alcohol or not and this will occur with the help of the breathing system of our body or we can say with the help of Breathalyzer. It is very accurate and shows every minute behavior towards the benzene. This shows the analog resistive output supported to the concentration of alcohol. Whenever the conductivity of the sensor will increase then the gas concentration will also increase. We can use this sensor to find out the alcohol with different levels of concentration. The good points of this sensor is it is available at a very low cost and it is used in many applications.<sup>[5]</sup>

A. Pre-Accident Phase

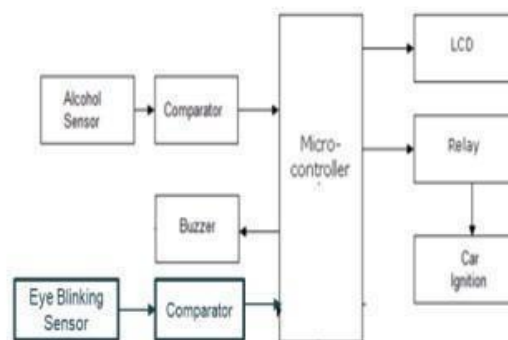


Fig.10. Alcohol Sensor

B. Post-Accident Phase

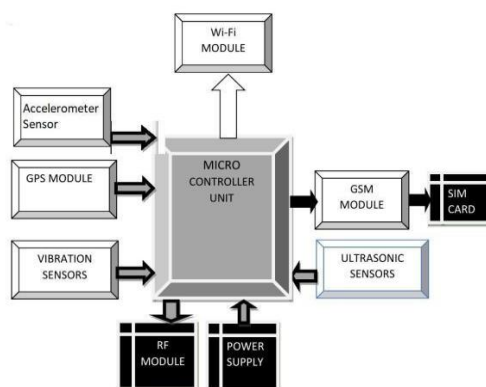


Fig.12. Block Diagram of Pre-Accident Phase



Fig.13. Block Diagram of Post-Accident Phase

### XIII. EYE BLINKING SENSOR

This is an IR based sensor. The Variation Across the eye will vary as per eye blink. Closed eye result in a high output, whereas other states denote lower ones. This helps to know the eye is closing or opening position. This output is given to the logic circuit to indicate the alarm. It can be used for detecting the accidents that take place because of one being unconscious.<sup>[8]</sup>



Fig.11. Eye Blinking Sensor

- BLOCK DIAGRAM
- WORKING

When the system operates firstly the GPS system starts getting connected and giving updates at every fixed interval of time and after some time alcohol sensor which is fixed in car if it reaches its threshold limit then automatically it sends the message that ALCOHOL IS DETECTED on the given saved number and all the fire and ignition related thing will be off. And then the ultrasonic sensor will start working and will check the seriousness of the collision and if it finds the distance less than 20 cm then it will start sounding the buzzer so that we can avoid an accident. If in the worst-case accidents occur then our vibration sensor will start working and if it will reach our threshold limit then with the help of GPS we send the particular location to the police and medications services and registered mobile number. It also sends the alert message if a vehicle catches any kind of fire with the help of a GSM system.<sup>[9]</sup>

### V. RESULT AND DISCUSSION

Threshold g-forces for accelerometer sensor

Table of result of Car crash test

Accident Severity	Actual Maximum G Range Represented [13]
No Accident	0-4g
Mild Accident	4-20g
Medium Accident	20-40g
Severe Accident	40+g

S.N O.	g-forces	Accident Severity	LCD Display	Message Send
1.	0	No Accident	Safe	NO
2.	5	Mild Accident	Accident	NO
3.	10	Mild Accident	Accident	NO
4.	20	Mild Accident	Accident	NO
5.	30	Medium Accident	Accident	YES
6.	40	Medium Accident	Accident	YES
7.	50	Severe Accident	Accident	YES

When Alcohol and Eye Blinking Sensor is above Threshold

Sr. No.	Status	Component	Input	Output
1	ON	GPS Module	As system started it takes coordinates	LAT(Latitude): 28.630152 LON(Longitude): 77.370041
2		Alcohol Sensor	1025(above threshold)	Sends "Alcohol detected" and ignition OFF
3		Eye Blinking Sensor	Above Threshold	Sends Rapid eye blinking detected and ignition OFF

When Accident Detected

S.NO	STATUS	COMPONENTS	INPUT	OUTPUT
1	ON	GPS MODULE	As system started it takes coordinates	LAT(Latitude): 28.630152 LON(Longitude): 77.370041
2		Alcohol SENSOR	1000(below threshold)	No Action
3		Ultrasonic Sensor	Distance<20cm	Buzzer will blow
4		Vibration Sensor	Above Threshold	Accident Detected
5		Fire Sensor	Above Threshold	Fire Detected

The particular system works in many different situations. Whenever it finds that the rider had consumed alcohol above the

saturation point then according to the above table 1 the alert sms will be sent and the main power will be automatically turned off. And in the second table whenever the automobile approaches any object and the gap between them is less than 20 cm then immediately it will alert the driver and if any tragedy happens then alert message will be sent to different units and if it catches fire it will send sms to fire authority.<sup>[2]</sup>

VI. CONCLUSION

The Accident Detection and Alerting system was designed or made in such an amazing way that it primarily detected any mishap that was to happen and prevented it. It also has an alcohol sensor and eye blinking sensor in the pre accident phase which detects the person who is going to ride the vehicle. If a person is drunk and has a rapid eye blinking, then it stops the ignition of the vehicle and informs the person by buzzer and prevents the accident. It is attached with a vibration sensor and accelerometer sensor for detecting the usual possibility of an accident by detecting the impact and speed of the vehicle and it is attached with an ultrasonic sensor that is used for the prevention of the accident in the post-accident phase. The system will also inform the family members about the condition of the victim, nearby police - station, hospital, and the nearby fire station through messages containing the location of the accident by using a GSM and GPS module in the case when the threshold value of the sensor is surpassed.<sup>[7]</sup>

IX. FUTURE SCOPE

A webcam can be used with respect to a future scope in order to have visual records of the accident. Automatic Brake locks can be applied in case of an accident, in generalized cases, accidents occur as a result of the driver losing control over the vehicle, of any sort. Once the accident occurs, heavy vibrations act as a stimulus for the vibration sensors in order to energize the processor. At the end, these processors must have a direct control over the locking brakes of the vehicle in order to apply them and avoid an accident and hence we fulfill the pre set objectives. Our systems can widely be used in food service vehicles, logistics verticals of companies, rented vehicles & etc.<sup>[9]</sup>

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