Accident Detection and Notification System

Prof. Vilas Gaikwad, Rohit Dabane, Pranita Sapre, Shreya Jadhav, Neeraj Jadhav

Computer Department, JSPM Narhe Technical Campus, Narhe Pune-411041.

Abstract:

There are lot of techniques that are deployed for the safety of the vehicle and it's passenger but still the accident keeps on happening so it is better to take prevention over the issues regarding the arrival of help after the accident occurs. As the number of road accidents are increasing day by day it is leading to a public health challenge. Many of the times the victims don't get a proper medical treatments. We are proposing a method for the vehicles who are moving from one place to another to provide safety and security. Here the road accident details are provided to the relatives, nearest hospitals along with the location of accident.

Index Terms:

 Accident, Accident Detection, Communication, GPS, GSM.

Introduction:

The number of fatal road accidents are increasing day by day and has been a great challenge put in front of public health and concerned agencies. Every day in newspapers the main news in the front page is a road accident. The most prominent deaths of today's population are because of road accidents [1]. Over 1,37,000 people were killed in road accidents in 2013 alone. This count is more than the number of soldiers who sacrificed their lives on battlefields. There are many reasons for road accident happenings like improper construction and maintenance of the roads, overcrowding and increasing count of vehicles. Apart from this, the lack of road sense by the drivers and other users of the road have further complicated the matters. Mostly the youngsters are losing their lives on roads because of rash driving, drunken driving and

other reasons, which is a great loss for our nation [2]. According to the World Health Organization, road traffic injuries caused an estimated 1.25 million deaths worldwide in the year 2010 i.e. one person is killed every 25 seconds [3]. There were 464,000 road accidents in 2015 in India. The states Tamil Nadu and Maharashtra reported (3,668) and (3,146) i.e. the largest number of people killed in two-wheeler accidents, while Uttar Pradesh reported largest number of lives lost due to (5,720) truck accidents and (2,135) car accidents [4]. A Report on Road Accidents in India 2016, published by Transport Research wing under Ministry of Road Transport & Highways, Government of India, has revealed that the country recorded at least 4,80,652 accidents in 2016, leading to 1,50,785 deaths. The number suggests that at least 413 people died every day in 1,317 road accidents [5]. At present India accounts for 10 percent of global road accidents with more than 1.46 lakh fatalities annually. Increased number of transportation has given rise to more number of road accidents. However, we cannot limit the increasing number of transportation but of course, we can limit the fatal road accident deaths with timely and effective communication of the accidents to hospitals and police. Nowadays technology has become the driving force of our modern world. Hence using micro-controller technology, we developed smart road accident detection and communication system. There exist many types of accident prevention systems installed in cars. The most common conventional accident prevention systems are bags, ABS etc.

Air bag: An airbag is a type of vehicle safety device and is an occupant restraint system. The airbag module is designed in such a way that during a collision or sudden deceleration the air bags inflates rapidly and deflates quickly to provide a safe landing to the driver's head. It consists of the

airbag cushion, a flexible fabric bag, inflation module and impact sensor or accelerometer. The airbag provides an energy absorbing surface between the vehicle's occupant and a steering wheel. Car air bags are effective safety features to prevent serious injuries at the time accident but have caused some fatalities [6]. Previous research has shown that the installation of air bags in vehicles significantly reduces crash related deaths, but these analyses have used statistical techniques which were not capable of controlling for other major determinants of crash survival [7].

(ABS): The most effective chassis control system for improving vehicle safety during severe braking is anti-lock braking system (ABS). Anti-lock braking mechanism prevents the locking of wheels at the time of panic braking to maintain a tractive contact with the road and thereby decreasing the braking distance of the vehicle. Anti-lock Braking can prevent accident, but it will not communicate. The automatic Accident prevention systems have recently been a part of many modern cars to reduce injuries and casualties on the road. However, these systems are limited to high-end luxury vehicle only, due to high cost of components and equipment [8]. In this paper we have developed an affordable and reliable system using Arduino UNO R3.

II.APPROACH:

Most of the methods used currently in these field of accident detection are using the sensors which are relatively intricate and fragile to the physical blows which leads to the failure of the system most of the time instead of prevention. This methodology was also including the use of ultrasonic sensors whose reading are probably inaccurate and mostly dynamic which leads to various deflections in the readings and mostly to procure errors. The reason of failure of this mechanism was the non-consideration of various factors related to of various factors related to the angle of impact and the resultant damage to be given to the vehicle and considerably to the sensors instead of getting the successful readings. Such that the position of sensors matters the most since they play the most

crucial role in gathering the data and if those important source of data are damaged the failure of the mechanism is fixed. Since the actions to be taken are in fraction of seconds the situation gets the real time degree for the purpose of implementation. So for processing the operations at high speed we are using the real time operation system so that the action takes place quicker and the resultant output to be conveyed frantically.

We apply our analysis on this case so that the result to be declared eminently without failure. Here we use air-bag deployment mechanism as our first stage for the system which is launched when the impact sensor is hit and it generates the impact which is compared to the calculated threshold so we save the time and the material to be used which probably reduces the cost of the mechanism. So we use the data gathered by the impact sensor to trigger the notification via GSM system which gives the notification in the form SMS which includes the link of the location of the accident taken place which will give the co-ordinates for the area accident gathered with the help of in-built GPS system of the car. This data will be used get the list of hospitals in the nearby area for notifying them and request for the help as well as to notify the close contacts of the person in the vehicle whose data is saved in the earlier process. In this way our system works with the less error rate and at very high speed as per required for the real-time application.
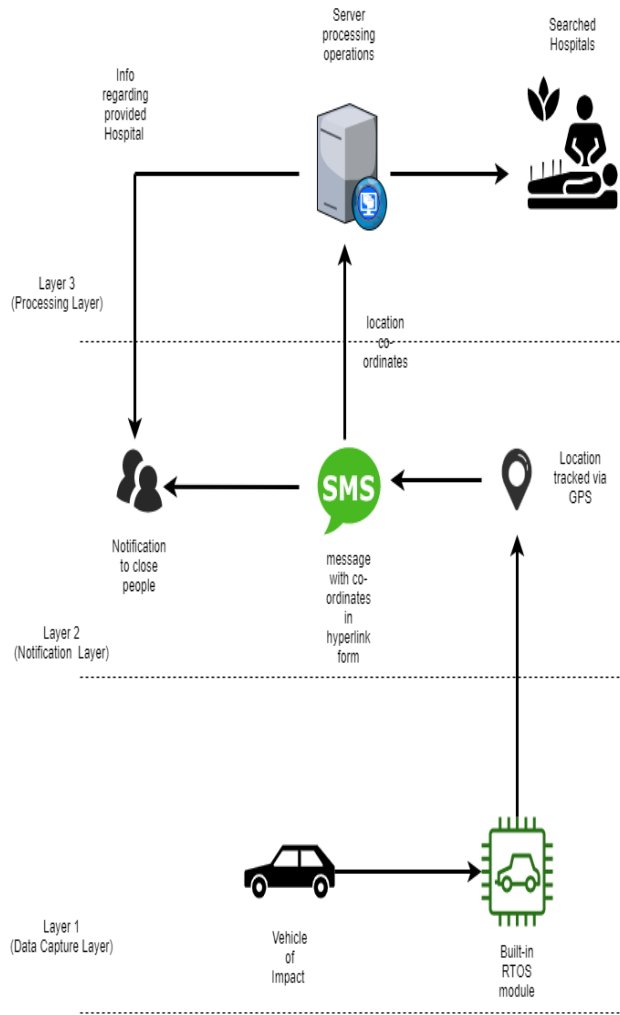
III.METHODOLOGY:

Fig. Architecture

Vehicle monitoring system with GPS helps in tracking vehicles. The tracking process alerts the driver and cautions him to drive carefully. Thus preventing the accidents [].

The GPS receiver receives the location coordinates from satellites with a resolution of 5 readings/second in NMEA format which contains a lot of information [1]. The

microcontroller processes these location information according to the algorithm stored in it, and extracts the longitude and latitude, then instructs the GSM modem via

serial communication to send SMS containing the longitude and latitude of the mobile tracking device. The primary focus of this research is to determine which

medical service location will be chosen based on some criteria including location radius, travel distance and time. The Haversine algorithm is used to obtain the distance between two different points

on the Earth's surface using latitude and longitude as variables. This algorithm can be defined as:

$$d = 2r\arcsin\left(\sqrt{\sin^2\left(\frac{\phi_2 - \phi_1}{2}\right)} + \cos(\phi_1)\cos(\phi_2)\sin^2\left(\frac{\lambda_1 - \lambda_2}{2}\right)\right)$$

Where d = distance
r = radius of earth
$\phi1$ & $\phi2$ = latitudes
$\lambda1$ & $\lambda2$ = longitude.

The TOPSIS Algorithm is to determine the possible solutions based on shortest distance from positive ideal solution and the furthest from negative ideal solution.
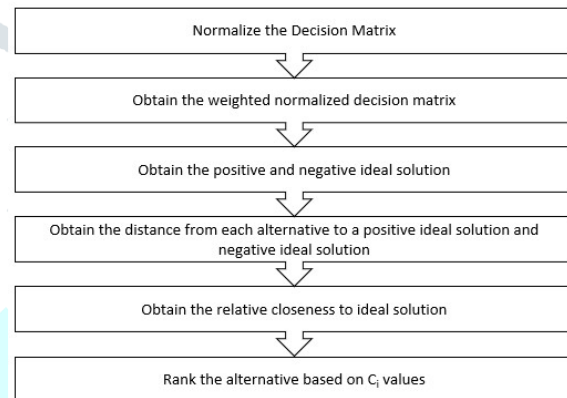
Flowchart of TOPSIS Algorithm

By this two algorithms we can determine the optimal distance.

Working Principle:

In this project we are using a Arduino UNO. When the system is switched on, LED will be ON indicating that the power is supplied to the circuit. When the vibration sensor senses any obstacle, they send interrupt to Ardiuno UNO.

The GPS receives the location of the vehicle that met with an accident and gives the information back. This information will be sent to a mobile number through message. This message will be received using internet present in the circuit. This message will give the information of longitude and latitude values. Using these values the position of the vehicle can be estimated. The received data is given to the Arduino UNO. Correspondingly it gives an acknowledgement in the form of an message to the mobile phone. LED used in the circuit displays the reception of messages. The Arduino interfaced to GPS modem via an internet,

where the devices are activated using select lines internally built in the internet. Internet is interfaced to Arduino UNO via transmit and receive pin.LED is interfaced to any ports of Arduino; it is used to display the current status of the GPS modem, whether data is being read from GPS.
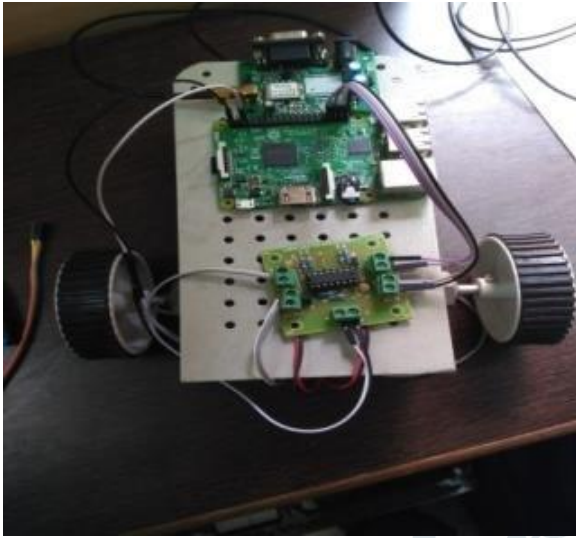

Fig. Working module of system.

Advantages:

• We can monitor the speed of the vehicle.
• We can find the location of the vehicle.
• Alert message to mobile phone for remote information.
• Mobile number can be changed at any time.

Application:

- Automotive and transport vehicles.
- Security, remote monitoring and transportation and logistics.
- This system also can be interfaced with vehicle alerting system.

IV.RESULT:

Through our analysis we intend to generate the notification quicker by considering all the important factors by employing the methodology presented in the previous sections and assisting user with the better help. Smart road accident and communication system has been developed. Experiments have been conducted by implementing the system in a toy car. It is observed that the system is working properly. We conducted various tests for different types of impacts and other test cases and recorded the outcome of the system and analyzed their accuracy and impact. The system sends the message to the stored emergency numbers successfully when the car is collided and toppled or tilted by certain angle or pressure is applied. This system sends the message by the use of the GSM and GPS module.

References:

[1] S. Gopalkrishnan, "A Public Health Perspective of Road Traffic Accidents", Journal of family medicine and primary care, vol.1, issue.2, dec2012, pp.144-150.
[2] Road accident statistics in India, available at http://sites.ndtv.com/roadsafety/important-feature-to-you-in-your-car-5/ viewed on 10 Jan 2018.
[3] List of countries by traffic-related death rate, available   at https://en.wikipedia.org/wiki/List_of_countries_by _traffic-related_death_rate
[4] Road accident deaths in India up 9% in 4 years, available at https://scroll.in/article/826264/three-killed-every-10-minutes-road-accident-deaths-in-india-up-9-in-4-years/ viewed on 10 Feb 2018.
[5] Road Accidents in India 2016-17, available at http://indianexpress.com/article/india/road-accidents-in-india-2016-17-deaths-on-roads-every-hour-chennai-and-delhi-most-dangerous-4837832/, viewed on 11 Feb 2018.
[6] Ching-Yao Chan, "A treatise on crash sensing for automotive air bag systems", IEEE/ASME Transactions on Mechatronics, Volume: 7, Issue: 2, Jun 2002.
[7] Samuel Jia Wei Tang, Kok Yew Ng, Boon How Khoo,
"Real-Time Lane Detection and Rear-End Collision Warning System on a Mobile Computing

Platform", in proceedings of IEEE- Computer Software and Applications Conference (COMPSAC), 1-5 July 2015, Taichung, Taiwan.
[8] SimonBarry, StephenGinpil, Terence, J.O'Neill, "Accident Analysis & Prevention", Elsevier, Volume 31, Issue 6, November 1999, Pages 781-787.

[9] Swetha Bergonda, Shruti,Sushmita,"
 IoT Based Vehicle Accident Detection and Tracking System Using GPS Modem".
[10] Neha Mangla, Sivananda G, Aishwarya Kashyap, Vinutha
," A GPS-GSM Predicated Vehicle Tracking System, in A Mobile App based on Google Maps"
[11] Nagarjuna R Vatti, PrasannaLakshmi Vatti, Rambabu Vatti, Chandrashekhar Garde," Smart Road Accident Detection and communication System"