

Survey on an Accident Detection and Notification System

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Abstract:

Every day around the world, a large percentage of people die from traffic accident injuries. An effective approach for reducing traffic fatalities is: first building automatic traffic accident detection system, second, reducing the time between when an accident occurs and when first emergency responders are dispatched to the scene of the accident. An accident detection and notification system uses GSM module to detect accident location and inform to all nearby hospitals and location coordinates are sent which are gathered from GPS. Accident intensity is detected by using Impact sensor. Accident condition inside of a car detected by Pi-cam and decisions will be taken. This system use impact sensor to transmit reading continuously to Arduino board and connected to server to which data is sent which detect accident event happen and notify all nearby hospital by data provided by sensors. Hospitals are provided by a link regarding emergency help service which will have accident event location coordinated and accident footage and take a decision on it.

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

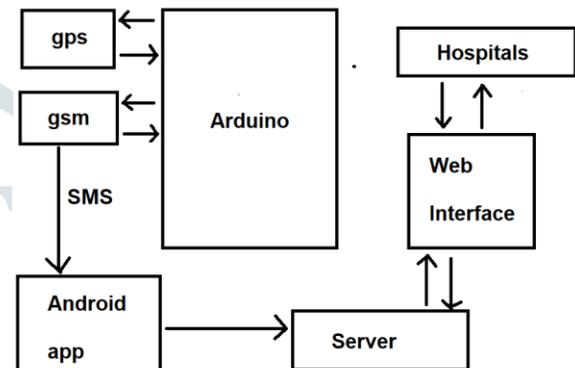
front page is a road accident. The most prominent deaths of today's population are because of road accidents [1]. Over 1.35 million people were killed in road accidents in 2018 alone. This count is more than the number of soldiers who sacrificed their lives on battlefields. There are many reasons for 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 1.35 million deaths worldwide in the year 2018 i.e. one person is killed every 25 seconds [3]. There were 1,49,000 road accidents in 2018 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 2018, 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.

In the existing systems the data is been collected using the mobile sensors itself which is not feasible for the system as the failure of the system may take place due to the low Battery of the mobile system and this failure can be resolved using our system since we are using the dedicated hardware which will not face the power failure issues and the system will carry out the operations continuously.



System Architecture

In this system the accident will be detected using the readings from the Impact sensor through which the further actions like notifying and searching of the nearest hospitals will be carried out. Here the location of the accident spot will be tracked using the GPS(Global Positioning System) which will give location co-ordinates and the GSM(Global System for Mobile networks) will be used for the purpose of notifying to the relatives and the hospitals with the location co-ordinates and the video footage link which will be given to the android application which will send the data to the server for the further processing of the data and the hospital system will be notified using the web interface.

II.METHODOLOGY:

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 [].

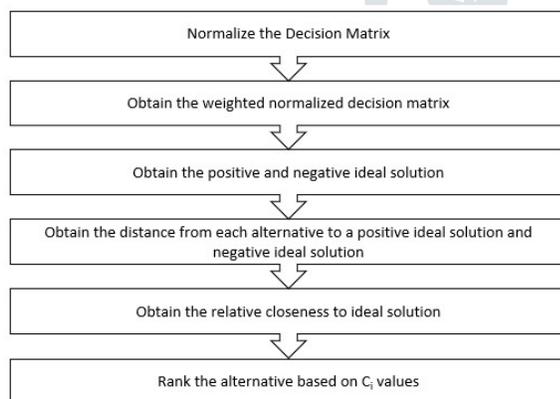
The GPS receiver receives the location coordinates from satellites with a resolution of 5

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
 ϕ_1 & ϕ_2 = latitudes
 λ_1 & λ_2 = 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 Arduino 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 a 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.

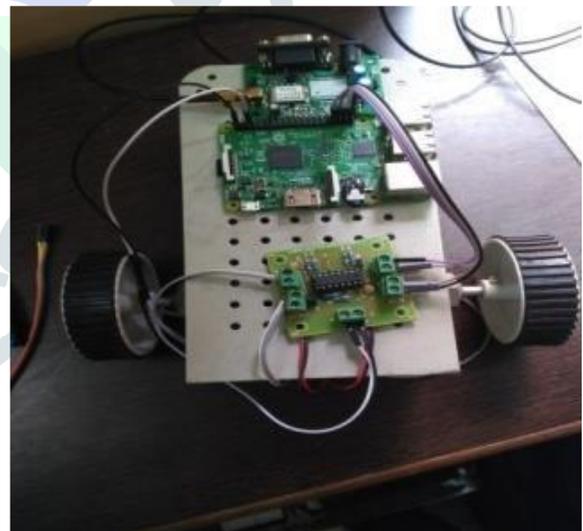


Fig. Working module of system.

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.

Conclusion:

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. 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] Simon Barry, Stephen Ginpil, 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, Prasanna Lakshmi Vatti, Rambabu Vatti, Chandrashekhar Garde," Smart Road Accident Detection and communication System"