

A Survey on Accident Detection, Tracking and Recovery of Vehicles

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Abstract - Worldwide road accidents are a major issue of concern. Even with so many modern devices present in the field of vehicle design, road lane design and heavy traffic control accidents do occur at a large scale. Every year worldwide, more than 1.25 million people are pronounced dead in road accidents. Most of the time, it happens that the death is caused due to the unavailability of the essential medical services at the moment of emergency situations. In most accidents, people lose their lives as no medical facility is reached there at proper time and place. To reduce this risk factor automatic accident detection system leads important role. Due to this device immediate action with respect to critical health care of victims can be taken care of. Accident detection device installed in a vehicles when meets with an accident will send SMS/ messages to the pre-install numbers of the drivers family members, police station, ambulance and nearest hospital. This embedded system is useful for tracking and retrieving the exact position of any vehicle which has met with an accident by using Global Positioning System (GPS) and Global System for Mobile Communication (GSM). This system notifies all the important numbers such as the police station, ambulance and the hospitals whenever an accident takes place and also provides the exact location on the map using the GPS. When an accident takes place, the shocks trigger the sensors leading them into concluding the mishap that has occurred and thus resulting into sending messages to the nearest helpline. For this, Renessa's micro-controller is used and is serially interfaced to a GSM modem and GPS receiver. The GSM Modem sends the position of the driver which is provided by the GPS and the same data is send to the nearest Police Station, Emergency Facilities, and other per-registered Emergency Contacts.

Keywords: Accident Detection, Short Message Service SMS, Global Positioning System GPS, Global System for Mobile Communication GSM, Sensors, Renessa's micro-controller.

1. INTRODUCTION

In last few decades, increase in the number of the vehicles on road safety has become tremendous problems. Thus causing the rise in the number of accidents and deaths due to accident because of drastic increase in the number of vehicles in last few years. According to W.H.O. (World Health Organization) every year worldwide more than 1.25 million people lose their lives due to road accident. India alone has

1% of the total roads in the world. But the accident recorded on Indian road are 16% of the world's road accident. There are many possible reasons for these such as drastic increase in the number of vehicles without any increase in the road quality and facilities that is essentially required for it. The number of accident rates increase according to the condition of roads, climate and state of drivers health.

Another important reason can be improper medical help. Survey shows that each minute that an injured crash victim does not receive emergency medical care can cause into fatality. Most victims lose their lives due to such reasons. Therefore, this idea of saving lives by curing the problem comes into existence.

Real-time position of the vehicles are informed by the system using the pre-install smart sensing equipment. This data is recorded and all the information can be observed by remote location to provide the required services to the victims. Tracking of the vehicle can be done in all-weather condition. GPS and GSM technologies are used in this system to provide all the data to the remote server which are then processed and the extracted information is used to provide the services to the individual at the time of emergency.

The main contributions of this paper are: (a) Developing a new system which helps the community in reducing the death rate resulting from vehicle accidents. (b) Collecting geographical data which can be analyzed to extract roads conditions, and to generate reports about vehicle accidents. (c) Implementing a navigation system to find the closest route for the rescue team to reach the crash site. (d) Implement this system into a car as well as a motorcycle.

2. PROPOSED SOLUTION

This proposed system is mainly used for tracking various vehicles either small vehicles like cars, motorbikes by their owners or various large size vehicles like buses and loaded trucks by the authorized company. If an accident occurs this tracking system helps to retrieve the exact position of the vehicles. This system sends an automated message to all the pre-install numbers in the device such as the drivers family members, police station, ambulances and the nearest hospitals. Exact position of the vehicles can be acquired by the help of the GPS (Global Positioning System).

GSM(Global System for Mobile Communication) is used to send and receive the message to the various people of the accident that has happened. All the entire working of the hardware is executed with the help of the Redness's Micro controller. This micro-controller coordinates with all the modules and helps sending the message. When an accident happens the shock triggers the sensors resulting into sending signals to the micro controller. Once the signal is received the micro controller then sends the result according to its programming.

3. LITERATURE SURVEY

Due to higher accident rates vehicle tracking is very important now days. This can be done easily by the use of the GPS technology. Various other applications can also be used to do so [1]. These applications are also used in fleet management, anti-theft vehicle systems and accident recovery [2].

A. Vehicle Tracking:

The vehicle tracking technology uses the GPS systems via many applications. These applications are very helpful as they track the vehicles and their partner web applications also monitor the vehicles continuously [1]. There are various ways to track a vehicle. Larger organizations use web services to track large number of vehicles whereas small scale industries can use various mobile apps. To find exact location, distance and estimating time to reach particular destination an android app is developed [3]. Theoretically it is easy to say we can get the exact location of a vehicle, but practically sometimes it is next to impossible. Even though we have advanced technology it is very difficult to actually obtain the geographical coordinates correct all the time. Use Kalman filter can be done, to get an exact longitude and latitude position[9].

B. Anti-Theft Vehicle System:

Due to the increase in market value and higher salary, most people afford cars. Even though most of them own cars not everyone knows the safety measures. There are cases where they can be easily stolen from the parking spot without the owners. To avoid such situations many systems are being developed and are being used that either help in providing anti-theft measures or at least recovering the vehicle. The system works in a very simple manner i.e. when an unauthorized person breaks into the vehicle it starts a loud alarm which tends the person flee away from the scene. If the person tries to start the vehicle, system sends the message(warning or alarm) to the owner by using the GSM mode. The authorized person or owner can stop the moving vehicle if in motion or can send the password to start the ignition [4]. If the vehicle in motion has been stopped by the user, we can track the position of the vehicle by, the tracker

system installed in the car, getting its altitude, latitude and longitude [5]. Radio Frequency (RF) transmitter and receiver is a very useful device to identify vehicle theft. When receiver stops receiving the signal from transmitter, an SMS will be sent to authorized person/ owner. The authorized person/owner can send the commands to stop the ignition of the vehicle. Position of the vehicle can be easily tracked by using the GPS [6]. There are ways to block the gas feed line of the vehicle as well, an automated SMS through GSM can be sent to the vehicle to perform the action. So, that vehicle will not ignite [7].

C. Camera Processing System:

New technology namely Image Processing is being used in many countries. Most of the countries use this technology for traffic purposes but there are ways where this is used for tracking of vehicle. Two cameras are consequently used one of which is used to track the vehicle and second is used to identify the number on the number plate. By using numerous algorithms, vehicles can be traced and movement of vehicle is captured from first camera [8].

D. Location Identifier and immediate recovery of accident:

As we already know there are numerous ways to track the location of an vehicle which has already met with an accident. We also know that there are ways where we can notify the authorized person about the mishap that has happened. When accidents happen it becomes very difficult to send help to the victims as no notification the accident has reached the hospitals, police or the family members of the victim. Thus resulting in a huge loss of life. To avoid such situations we can send an automated SMS to the predefined numbers in the system. Bluetooth Technology is used as a medium to activate the GPS by the sensors. It is an intermediate between the sensors and the GPS. But now not only Bluetooth technology can be used but also MESA technology can be used to activate GPS and send the location coordinates to the predefined numbers[10].

4. METHODOLOGY

This accident detection & recovery model consists of various micro-controller, software and hardware components such as:

1. Piezoelectric Sensor

A piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain, or force by converting them to an electrical charge. The prefix piezo- is Greek for 'press' or 'squeeze'. This sensor is inbuilt in various cars for airbag system. This sensor senses the pressure and vibration

during the accident and transmits the electrical signal to the encoder.

2. RF Encoder and Transmitter

Radio Frequency (RF) module encodes the received electrical signals into suitable form so that transmitter can send it to the receiver of the vehicle.

3. RF Receiver and Decoder

An RF module (radio frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wireless. This wireless communication may be accomplished communication or through radio frequency (RF) communication. The signal transmitted through the transmitter section is received by the RF receiver and RF decoder decode that signal.

4. Renesas micro-controller

This micro-controller is brain of the Vehicle Tracking System (VTS). Renesas ports are used for GPS and GSM/GPRS modules. A software program is written to control them, and stored in microcontroller's flash memory.

5. GPS Module

A GPS navigation device, GPS receiver, or simply GPS is a device that is capable of receiving information from GPS satellites and then to calculate the device's geographical position. Using suitable software, the device may display the position on a map and also provide directions. The Global Positioning System (GPS) uses a global navigation satellite system (GNSS) made up of a network of a minimum of 24, but currently 30, satellites placed into orbit. The GPS module has Receiver with antenna which provides the location of the vehicle. The GPS system is commonly used to get information about coordinates, speed, time and distance. In this module, a GPS system is adopted to implement the in-vehicle device.

6. GSM/GPRS Module

General Packet Radio Services (GPRS), a packet-based wireless communication service. In this device, it is responsible for establishing connection between victim vehicle device and a remote device and for also transmitting the message to all the predefined numbers which contains the information about the vehicle location. GSM/GPRS network uses TCP/IP connection.

6. CONCLUSIONS

Although no vehicles can be entirely secure or no accident can be avoided, this system tries to lessen the possibility of those.

The design and implementation of vehicle tracking system in real time system providing the location of the vehicle and accident is described in this paper. As the sensors in the car detect a collision it sends the data to the receiver. After decoding the received signal by RF decoder, this signal is then transmitted to the micro-controller. The predefined program written in the micro controller does all the work of controlling and processing incoming signals and taking necessary actions. The message will be sent to ambulance, police station and all the pre-install numbers using the GSM module with GPS coordinates. Implementation of this system has a very low cost.

This project provides a vague idea of how we can extract a location of accident and help can be provided to the victims. It also defines the importance of the accident detection system, its working and its use to save the precious life.

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