

Accident Avoidance and Detection

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Abstract— Speeding and drunken drive are the basic reasons for vehicle accident. Many lives could have been saved if emergency service could get accident information and reach in time and if drunken drivers are prevented from driving. Nowadays, GPS has become an integral part of a vehicle system. This paper proposes to utilize the capability of a GPS to send accident location to an Alert Service Center. The accelerometer will monitor speed of a vehicle and measure the impact of collision. Whenever the speed will be below the specified speed, it will assume that an accident has occurred. The system will then send the accident location acquired from the GPS along with the time and the speed by utilizing the GSM network. Also in this paper we check whether the person is drunken or not by using the MQ3 GAS sensor. In this system, sensor circuit is used to detect whether the alcohol was consumed by driver or not. When alcohol concentration is detected then vehicle's information will go to traffic police through GSM and thus preventing accidents. This will help the rescue service to reach in time and save the valuable human life.

This paper is based on EMBEDDED C programming using Arduino mega.

Index Terms— Arduino, accelerometer, GPS, GSM, Alcohol sensor MQ3, HC-SCR04, Fire sensor, Piezoelectric discs.

I. INTRODUCTION

Due to recent technological and population development, the usages of vehicles are rapidly increasing and at the same time the occurrence of accidents has also increased.

Road accidents and traffic congestion are the major problems. Hence, the value of human life is being ignored. Accident prevention is difficult. They involve high human suffering and monetary costs in terms of untimely deaths, injuries and loss of potential income.

II. EXISTING SYSTEM

There are so many new techniques such as Antilock Braking System (ABS), Adaptive Cruise Control (ACC), and Anti Collision System (ACS) to avoid accidents and in spite of all this, such large number of accidents takes place.

The frequency of traffic collisions in India is amongst the highest in the world. A National Crime Records Bureau (NCRB) report revealed that every year, more than 135,000 traffic collision related deaths occur in India.

According to road traffic safety experts, the actual number of casualties may be higher than what is documented, as many traffic accidents go unreported (detection will be helpful here)

the major causes of traffic collisions as driving over the speed limit, driving under the influence (alcohol) and not wearing helmets and seat belts.

Also due to the delay in reaching of the ambulance to the accident location and the traffic congestion in between accident location and hospital increases the chances of death of the victim.

III. PROPOSED SYSTEM

There is a need of introducing a system to reduce the loss of life due to accidents and the time taken by the ambulance to reach the hospital. To overcome the drawback of existing system we will implement the new system in which there is an automatic detection of accident through sensors provided in the vehicle. A main server contains list of all hospitals in the city. The main server finds the nearest ambulance to the accident zone and sends the exact accident location to the emergency vehicle.

A GPS and GSM module in the concerned vehicle will send the location of the accident to the main server which will rush an ambulance from a nearest hospital to the accident spot. This system is fully automated, thus it finds the accident spot and helps in reaching the hospital on time.

The Embedded Technology is at its peak and acting as a game changer in many industries. Embedded technology plays a major role in a wide spread of industries, because of key feature called integration.

It brings different sources of departments under a single umbrella. This increase productivity and quality of product with less human interference. This intelligence include many lifesaving aspects like unexpected device failure, high accuracy diagnosis; this can be achieved by implementing online health monitoring system. Vibration technology can be used in fault detection. This is applied in alcohol detection.

This system detects the content of alcohol in the breath and thus it attempts to clamp down alcoholics. Nowadays alcohol sensor play a significant role in our society and it has vast applications. This type of sensors in cars is a great safety factor which can be embedded in the steering of the cars. When high alcohol content is detected in the driver, this system sends short message to mobile number via GSM modem. Message will give longitude and latitude values. From these values location of accident can be prevented.

Thus this system emphasizes on post-accident system for detecting and informing about it.

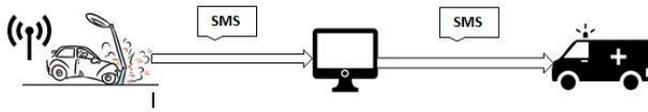


figure 1: Overview of application

IV. METHODOLOGY

The system (fig 2) consists of three units: vehicle unit, control unit, and ambulance unit.

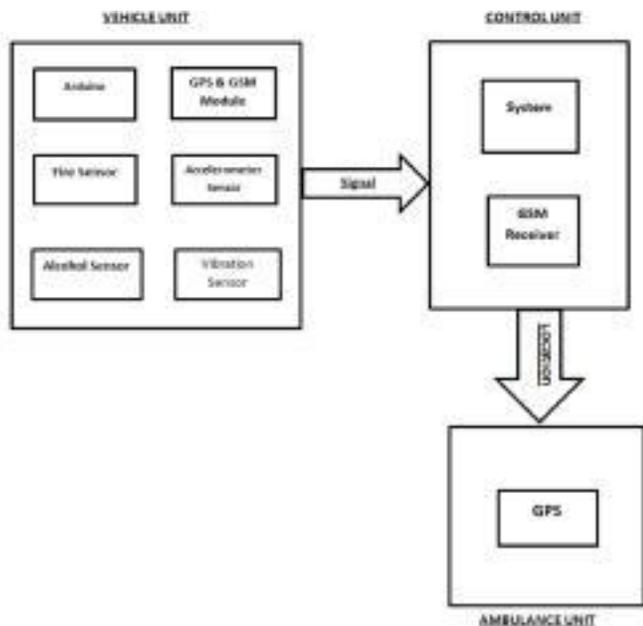


Figure 2: Architecture

A. Vehicle unit

For implementation of this project, vehicle unit should be installed in every vehicle .It consists of arduino along with the accelerometer, GPS and GSM module and sensors to sense the accident. The accelerometer is used to check the speed of the vehicle. The g-force is used to find the acceleration of the car. The changes in the axis of the accelerometer are observed. If the observed value is greater than the threshold accident has occurred. The piezoelectric discs are used to identify collision. On impact on the vehicle or when the speed increases, information about accident is send to the control unit. This information consists of the location of accident detected by GPS module installed in vehicle. The GPS system finds out current position of vehicle (latitude and longitude) which is the location of accident spot and gives that data to GSM module. This information to the control unit is sent by GSM module. There is also provision of avoidance of accident by using alcohol sensor (MQ3). Alcohol sensor detects the level of alcohol of the vehicle driver and sends a message which

consists of the position to the control unit which then sends the location to the traffic police.

B. Control unit

Control unit is the brain of our system. Practically, the control unit will contain all the information about the hospital location and the contact number of all the hospitals in order to send an ambulance to the accident spot. The system calculates the nearest distance from the accident spot to the nearest hospital location through a Google API. It receives the message through another GSM module about accident location from the GPS and GSM module installed in its vehicle unit and responds.

C. Ambulance unit

Control unit sends the ambulance to the accident location. Ambulance serves the victim from the accident location.

V. HARDWARE SECTION AND ITS IMPLEMENTATION

Hardware sections used in our detection system includes GPS modem, GSM modem, Alarm Module, Arduino, Alcohol MQ3 sensor, HC-SCR04, Fire sensor, Piezoelectric disc.

A. Global System for Mobile Communication (GSM)

GSM is global system for mobile communication and used to send message to pre-programmed number. The modulation technique used is GSMK. The protocol used by GSM modem for setup and control is based on the Hayes AT- Command set. AT is the abbreviation of Attention. GSM AT commands are extension commands. For example, +CMGS (Send SMS message), +CMGL (List SMS messages), and +CMGR (Read SMS messages) are extended commands. The main objective of this application is whenever accident occurs it will send message of position of vehicle which is accessed using GPS to pre-programmed number. [5]GSM Air Interface specifications: [4]

B. GPS Receiver

The System (GPS Global Positioning) is a space age navigational system that can pinpoint your position anywhere on the globe, usually within a few yards or meters. GPS uses a constellation of 24 satellites in precise orbits approximately 12,000 miles above the earth. The satellites transmit data via high frequency radio waves back to Earth. GPS uses satellite ranging to triangulate your position. In other words, the GPS unit simply measures the travel time of the signals transmitted from the satellites, then multiplies them by the speed of light to determine exactly how far the unit is from every satellite it's sampling. Distance= velocity (speed) x time

Then locking onto signal from minimum 3 different satellites, GPS can calculate a latitude and longitude and track movement. With four or more satellites in view, the receiver can determine the user's latitude, longitude and altitude. [2] GPS receiver uses NMEA -0183 protocol as defined by the National Marine Electronics Association (NMEA).It gives output messages as follows. So we get 7-8 different messages.

GGA-Global positioning system fixed data.

GLL- Geographic position – latitude/longitude.

GGA contains message ID, UTC position, latitude, longitude, north-south, east-west.

Message ID- \$GPGGA that is called as protocol header. [3]

C. Arduino

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

D. Accelerometer

An accelerometer is a Micro-Electro Mechanical System (MEMS) sensor which measures static (earth gravity) or dynamic acceleration in all three axes. It measures level of acceleration where it is mounted which enable us to measure acceleration/deceleration of object like car, or tilt of a platform with respected to earth axis, or vibration produced by machines. Accelerometers measure in terms of ‘g’ (‘g’ is acceleration measurement for gravity which is equal to 9.81m/s²). Accelerometer converts mechanical motion into electrical output.

E. Alcohol sensor

Alcohol sensor can be fixed in vehicle near the steering. When vehicle user is drunk, it is sensed by MQ3 gas sensor and vehicle driver is prevented from driving.

F. HC-SR04 sensor

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit.

G. Piezoelectric Discs

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.

VI. RESULTS

The figure 3 indicates the snapshot of the system that represents the tracking of the location for a particular vehicle.

The system detects accident from the vehicle and sends message through GSM module. The message is received by another GSM module. The server (fig 4) measures the shortest distance and sends ambulance to the accident spot.

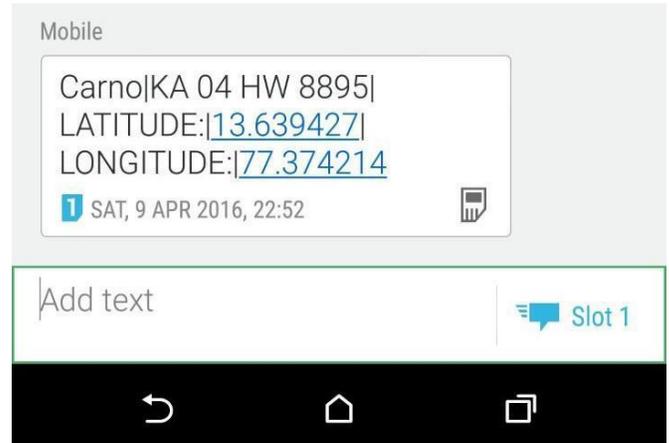


Figure 3: showing received GPS data through SMS

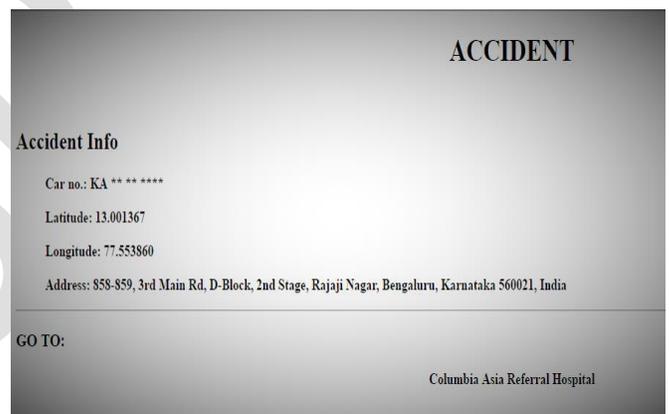


figure 4: server part showing which hospital to go

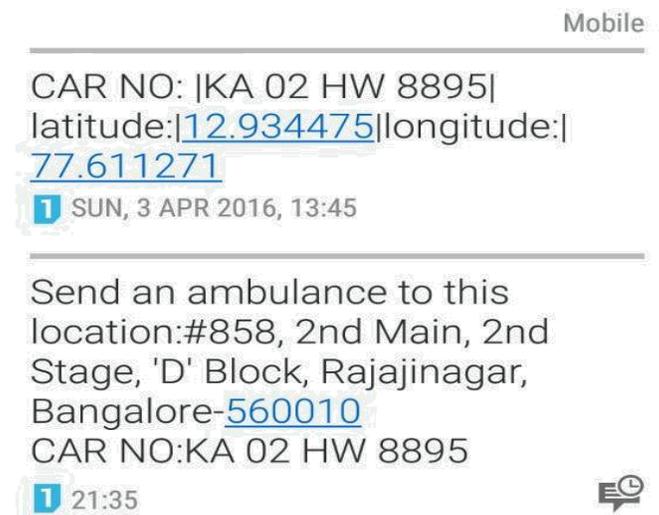


figure 5: shows where ambulance has to be sent

VII. CONCLUSIONS

An automatic accident prevention and reporting system is designed and implemented using technologies like to prevent accident, GPS modem for finding the location of vehicle in terms of latitude and longitude, as well as GSM for sending message on mobile at the receiver end. As we conclude our paper here along with the entire stimulus, we are still willing to upgrade the application of enhanced technology for the electronic equipment usage efficiency. The snapshot indicates the messages alerts when our accident alert system is tested at two different locations near to one another. Hence, there is a small variation in the coordinates, the initial value of latitudes and longitudes are same but the fractional value changes with small difference.

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