Accident Monitoring and Detection System in Vehicles

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Abstract **- The rise of technology and infrastructure has made our lives easier. the entrance of technology has also increased the traffic hazards and also the road accidents happen frequently which causes huge loss of life and property due to the poor emergency facilities. This project is a few systems which is developed automatically to detect an accident and alert the closest emergency services. this technique may locate the place of the accident, so the medical services is directed immediately towards it. The system comprises of accelerometer, ultrasonic sensor, vibration sensor GPS and GSM Module support in sending message. Accelerometer detects the sudden change within the axes of car. Vibration sensor detects the heavy vibration within the vehicle. Ultrasonic sensors decrease speed of the vehicle when it comes closer to the opposite vehicle and GSM module sends the alert message to mobile with the situation of the accident. Location of accident is consigned within the kind of Google Map link, derived from the latitude and longitude from GPS module. Then after confirming the situation necessary action are going to be taken and this can help to achieve the rescue service in time and save the precious human life.**

Index Terms **- Crude Oil Spill, Oil Spill Detection, marine pollution, remote sensors, microwave sensors.**

I.INTRODUCTION

The development of a transportation system has been the generative power for human beings to have the highest civilization above creatures in the earth. Automobile has a great importance in our daily life. We utilize it to go to our workplace, keep in touch with our friends and family, and deliver our goods. But it can also bring disaster to us and even can kill us through accidents. In 2009, 33,808 people died in vehicle traffic crashes only in USA [1]. Speed is one of the most important and basic risk factors in driving. It not only affects the severity of a crash, but also increases risk of being involved in a crash.

Despite many efforts taken by different governmental and non-governmental organizations all around the world by various programs to aware against careless driving, yet accidents are taking place every now and then. However, many lives could have been saved if the emergency service could get the crash information in time. A study by Virtanen et al. shows that 4.6% of the fatalities in accidents could have been prevented only in Finland if the emergency services could be provided at the place of accident at the proper time [2]. As such, an efficient automatic accident detection with an automatic notification to the emergency service with the accident location is a prime need to save the precious human life.

The Global Positioning System (GPS) is a popular technology which was developed by American Department of Defense (DoD) for military use. Later on it was available for civilian use. It is utilized for wide range of applications such as location, direction, speed, timing, surveying, logistics, traffic management, security etc. Nowadays, it has become an integral part of a vehicle system for tracking and navigation system. It can provide accurate time, location coordinate and speed. On the other hand, Global System for Mobile communications (GSM) is a digital mobile telephony system that is widely used. More than 690 mobile networks provide GSM services across 213 countries and GSM represents 82.4% of all global mobile connections. Besides the voice communication it also offers Short Message Service (SMS) and General packet radio service (GPRS) to transfer data. This paper proposes to utilize the capability of a GPS receiver to monitor the speed of a vehicle and detect an accident basing on the monitored speed and send the location and time of the accident from the GPS data processed by a microcontroller by using the GSM network to the Alert Service Center. The rest of the paper is organized as follows. The Related Work section discusses about the researches

related to the accident detection system, the Equipment and Proposed Methodology section describes the required equipments and algorithm to detect the accident, the Accident Detection and Reporting Procedure describes the procedure to calculate the speed to detect accident and sending procedure and finally the paper is concluded.

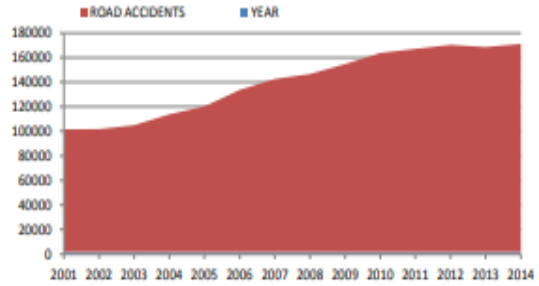

Fig 1 : Road Accidents Year-wise 2001 – 2014

Traffic is on the increase because the demand for vehicles is getting higher day by day. So, transportation needs improvement as, since demands are increasing, there will be more possibility of car accidents. Vehicle accidents are one in every of the leading causes of the fatalities. it will be a heavy consequence if people cannot get assistance on right time. Poor emergency incident may be a major reason for death rate in our country. Crash analysis studies have shown, traffic accidents could be prevented with the utilization of this advanced life saving measure. This design focuses on providing basic information on the accident site to the emergency contacts. As a result of the sudden help, precious life may get saved. during this work, a three-axis accelerometer and GPS tracking system work for accidental monitoring. This design detects accidents in less time and sends this information to the specified authorities. The development of a transportation has been the generative power for citizenry to own the best civilization above creatures within the earth. Automobile features a great importance in our way of life. We utilize it to travel to our workplace, confine touch with our friends and family, and deliver our goods. But it may also bring disaster to us and even can kill us through accidents. Speed is one in every of the foremost important and basic risk factors in driving. It not only affects the severity of a crash, but also increases risk of being involved in an exceedingly crash. Despite many efforts taken by different governmental and nongovernmental organizations all round the world by various programs to aware against careless driving, yet accidents are going down every now then. However, frequent lives could are saved if the emergency assistance could get the smash information in time. As such, productive automatic accident detection with an automatic information to the emergency service with the accident location may be a prime must defend the beneficial human life. This project is to employ proposes to advance the potential of a GPS receiver to detect the speed of a vehicle and detect an accident basing on the supervises speed and send the placement and time of the accident from the GPS data processed by a microcontroller by using the GSM network to the Alert Service Centre.

II.RELATED WORK

Many researchers carried out their studies on accident detection system. Traditional traffic accident prediction uses long-term traffic data such as annual average daily traffic and hourly volume. In contrast to traditional traffic accident prediction, real-time traffic accident prediction relates accident occurrences to real-time traffic data obtained from various detectors such as induction loops, infrared detector, camera etc. Real-time traffic accident prediction focuses on the change of traffic conditions before an accident occurrence, while traffic incident detection studies are concerned with the change of traffic conditions after an incident occurrence [3]. However, the performance of these detection and prediction system is greatly restricted by the number of monitoring sensor, available fund, algorithms used to confirm an accident, weather, traffic flow etc. Besides the automatic detection system, manual incident detection methods detect the accident from the motorist report, transportation department or public crews report, aerial surveillance or close circuit camera surveillance. The drawback of this type of detection system is that someone has to witness the incident. Moreover, there are delays and inaccuracies due to the expression problem of the witness. Compared to these detection methods, driver initiated incident detection system has more advantages which includes the quick reaction, more incident information etc. However, with the severity of the accident, driver may not be able to report at all.

Conventional built-in automatic accident detection system utilizes impact senor or the car airbag senor to

detect an accident and GPS to locate the accident place. L. Chuan-zhi et al. proposed a freeway incident detection system by utilizing the car air bag sensor and accelerometer, GPS to locate the accident place and GSM to send the accident location [4]. However, the system did not utilize the GPS to detect the accident. A smart phone-based accident detection system is proposed by C. Thompson et al. [5]. However, smart phones are very expensive and due to false alarm filter, it may not detect all accidents. An acoustic accident detection method is proposed by D. A. Whitney and J. J. Pisano [6]. There are possibilities of false alarm in the system and also does not guarantee the occurrence of an accident. An accident detection by utilizing an impact sensor and reporting system by wireless module is proposed by R.K. Megalingam et al. [7]. However, a wireless reporting infrastructure is very expensive and difficult to implement as installation of repeated receivers on the road at a very short interval are required. The proposed method aims to overcome the above-mentioned limitations and utilizes only the GPS data to detect the accident and GSM network to send the location and activate a voice channel with the Alert Service Center.

III.METHODOLOGY

A 9V compact power surplus will power the Arduino board. The GPS and the GSM shield and the impact sensor will derive power from the Arduino board itself. The circuit is first initialized and the GPS and GSM module is turned on. The system hold till the GSM module acquires a signal and is registered with the network. The system then goes on standby until the impact sensor gives a positive output. Once the accident is detected, Arduino acquires the current location of the vehicle using the GPS module and the co-ordinates are then sent via SMS to emergency services and/or contacts the user may have stored.

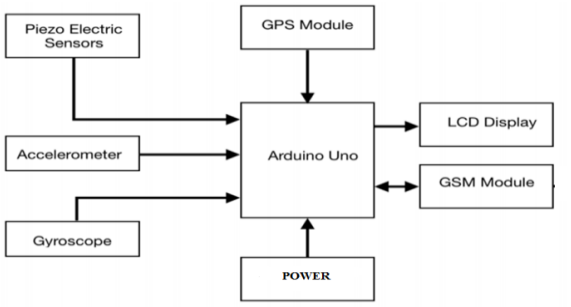

Fig 2: Block Diagram

Hardware Requirements

- Arduino Uno R3
- Gsm Modem
- Gps
- Keypad
- Lcd Display
- Accelerometer
- Gyroscope
- Piezo Electric Sensor
- Switches
- Power Supply

Software Requirement

- ARDUINO IDE
- Embedded C

IV.HARDWARE IMPLEMENTATION

Arduino UNO

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by arduino. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under Common Creative Attribution Share-Alike 2.5 license and is available on the arduino website. Layout and production files for some versions of the hardware are also available. "UNO" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The UNO board and version 1.0 of arduino Software (IDE) were the reference versions of arduino, now evolved to newer releases. The UNO board is the first in a series of USB arduino boards, and the reference model for the arduino platform. The ATmega328P on the arduino UNO comes preprogrammed with a boot loader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. The UNO also differs from all preceding boards in that it does not use

the FTDI USB-to serial driver chip. Instead, it uses the Atmega16U(Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Fig -3: Arduino Board

LCD

Liquid Crystal Display (LCD) is used to display the output to the user in the form of GUI (Graphic User Interface) and a mono chromatic display. LCD used in this project is JHD162A series. There are 16 pins in all. They are numbered from left to right 1 to 16 (if you are reading from the backside). Generating custom charcters on LCD is not very hard. It requires the knowledge about custom generated random access memory (CG-RAM) of LCD and the LCD chip controller. Most LCDs contain Hitachi HD4478 controller. CG-RAM is the main component in making custom characters. It stores the custom characters once declared in the code. CG-RAM size is 64 byte providing the option of creating eight characters at a time. Each character is eight byte in size.

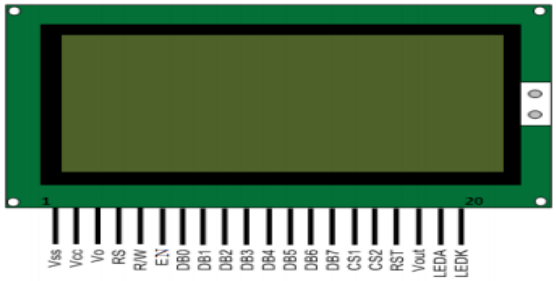

Fig 4: LCD

GPS sensor

The GPS system provides critical positioning capabilities to military, civil, and commercial users around the world. In our project we are using the GPS sensor module EM-406A, as it is new improved GPS Module with built-in antenna and memory back-up for OEM. This unit features low power consumption, high sensitivity. The unit is ideal for navigation systems, distance measurements, vehicle monitoring and recording, boating direction and location, together with hiking and cross country exploring.

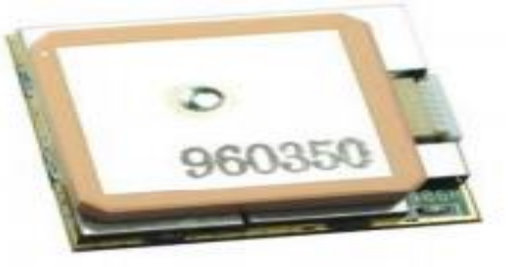

Fig 7: GPS Receiver

GSM Module

An energy meter is a device that measures the amount of electrical energy supplied to or produced by a home or building. The most commonly used energy meter is kilowatt hour meter. Instantaneous power is calculated by taking the product of the instantaneous current and voltage. This instantaneous power is then integrated against time to give energy used by the consumers. The meters are classified into two basic categories, electromechanical and electronic. The energy consumption is calculated by using the output pulses of energy meter. The load is said to consume 1 unit of electricity when the internal counter of microcontroller counts upto 3200 pulsesGSM engine works on frequencies 850MHz, 900MHz, 1800MHz and 1900MHz.It is very compact in size and easy to use. It is designed with RS232 level converter circuitry, which allows you to directly interface PC serial port. The baud rate can be configurable from 9600-115200 through AT command. Using this modem, you will be able to send and receive SMS and also connect to internet via GPRS through simple AT commands.

Fig-4: GSM

VIBRATION SENSOR

The sensor accustomed detect accident is shock sensor. this is often one stage shock sensor; it detects any hard impact acted thereon. The output from sensor after impact are +5v and connected to INT (pin 12) of processor. These sensors are fixed on all sides of the car to detect impact occurred thereon. These outputs from sensors are send into gate to detect a minimum of one impact. it is integrated within the circuit system by connecting all the sensors to gate whose output is connected to the int pin of microcontroller. These sensors are connected in such the simplest way that they detect force impact occurring from any side of the car. this is often concerned to the protection of the system of the human driving the car in order that once accident is detected the paramedics can reach to the placement as soon as they will.

ADXL345 ACCELEROMETER

The ADXL345 is analogous temperament for mobile device applications. It parts the static acceleration of gravity in tilt-sensing operations, additionally as dynamic acceleration resulting from motion or shock. Its high perseverance (3.9 mg/LSB) enables frequency of inclination changes but 1.0°. It parts the pair dynamic acceleration resulting from motion or shock and static acceleration, like gravity, that enables the device to be worn as a tilt sensor. The sensor could be a polysilicon surface-micro machined structure built on top of a silicon wafer. Polysilicon springs append the structure over the surface of the wafer and quantity a resistance against forces due to applied acceleration.

V.SOFTWARE IMPLEMENTATION

The foremost aim of the system is to develop a coffee cost solution for tracking vehicular accidents. The proposed system works in two phases. within the primary phase, the Arduino monitors the pin at which the impact sensor is connected and waits for the input to urge active. within the second phase, the GPS receiver fetches the GPS location, after calculating the precise location, the GSM module creates a SMS which includes things of the accident and sends it to respective authorities.

The Arduino integrated development environment could even be a cross-platform application written in Java and derives from the IDE for the Processing programing language. Arduino programs are written in C or C++. The Arduino IDE comes with a software library called" Wiring" from the primary Wiring project, which makes many common input/outputs operations much easier. The users need only to define two functions to make an executable cyclic executive program: 1) setup (): a function that runs once at the start of a program which may initialize settings. 2) loop (): a function called repeatedly until the board powers off. Flowchart for accident tracking.

1. Start
2. Power on all the modules
3. await the shock/vibration sensor to detect accident.
4. Get this location from the GPS modem.
5. Check whether the GSM modem is registered on the network.
6. Send the SMS.

VI.RESULTS AND DISCUSSION

Whenever accident of the vehicle occurs, then the device sends a message with the information of accident location to the predefined numbers so that help can be made available. The message sent with the help of the GSM module will appear like this - Mems moved accident, vib on accident alert." This system shows the location of vehicle where the accident has occurred with the help of the GPS module connected to it and hence that information is added in the form of latitude and longitudinal values in accident alerting message.

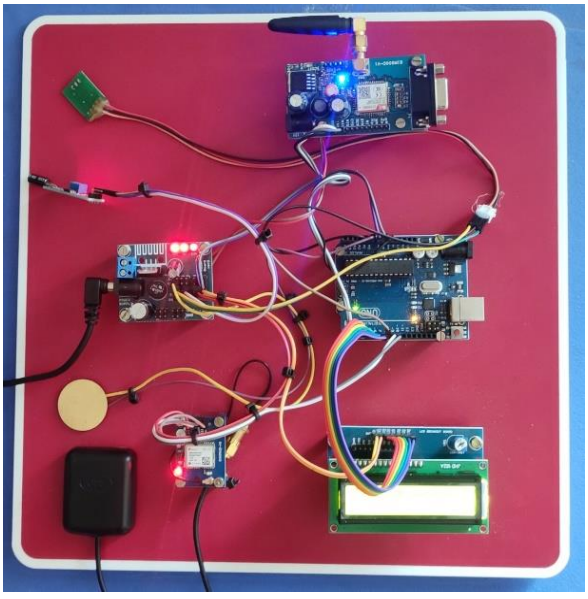

Fig 7. Experimental Setup

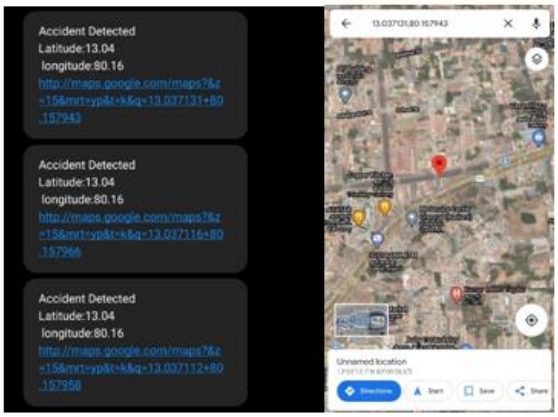

Fig 8: Vehicle tracking

VII.CONCLUSION

The papers provide various methods to detect accidents using both hardware and software methods which give good results. Most of the discussed methods also provide the driving force with the choice of turning of the alarm in cases where the accident is not serious or false detections of an accident. These methods are either mostly hooked into some hardware like sensors that need to be present within the car or require a sensible phone to be present within the car. While the utilization of such hardware can convince be a more cost-efficient approach it is the disadvantage of being destroyed within the accident and hence giving spurious or no readings in the least. Hence, an approach that does not depend upon any hardware device or sensor that is related to the car is required for the detection of traffic accidents. But this can be extended by providing medication to the victims at the accident spot. By increasing the technology, we can also avoid accidents by providing alerts systems that can stop the vehicle to overcome the accidents.

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