Sensor Based Automated Accident Tracking System

Mr. Akshay keshwatkar [1], Mr. Vishwa V [2], Mr. John Williams.R [3] , Ms. P.S.Smitha[4]

Department of Computer science and engineering, Velammal Engineering College, Chennai, Tamil Nadu, India[1, 2, 3] . Assistant Professor, Department of Computer science and engineering, Velammal Engineering College, Chennai, Tamil Nadu, India[4].

lionelvishy@yahoo.com, akshay.b.keshwatkar@gmail.com, johnjebabilly7@gmail.com

ABSTRACT--- *The growth in technology has made our lives simple. The advancement in technology has increased the hazards in traffic and road accidents taking place frequently causes loss of life and property this is due to lack of emergency and help facilities . Our paper provides a solution to this disadvantage. When an accident occurs immediately the vibration sensor detects the impact and micro electro mechanical system (MEMS) will detect this signal and send it to Arduino TDGGSM_908 microcontroller. The microcontroller initiates GPS, traces the accident location and sends an alert SMS using GSM to the police and medical rescue team. If the impact of the accident is less than the average calculated impact which causes threat to human lives then the alert SMS would not be sent.*

KEYWORDS--- Trace, **Accident, Arduino, microcontroller, micro electro mechanical system GPS, GSM.**

1. INTRODUCTION

Speed is one of the important and basic risk factors in driving. Road accidents constitute the major part of the accident deaths around the world. Over the past decade, automatic traffic accident recognition has become a prominent objective in the area of machine vision and pattern recognition because of its immense application potential in developing autonomous Intelligent Transportation Systems (ITS) [1].Though it credits technology for lessening auto accidents, yet IIHS cannot help accusing reckless driving behaviours like drinking and driving, over speeding and not wearing seatbelts for still causing major traffic deaths. Today, wireless innovation has tilted the odds in favor of success like never before [2]. At least 13 people die every hour in road accidents in the country, the latest report as per the National Crime Records Bureau reveals.

The purpose of the paper is to find the vehicle where it is and locate the vehicle by means of sending a message using a system which is placed inside of vehicle system. Most of the times, we may not be able to find accident location because we do not know where the accident happens. To give emergency treatment and to offer help to injured people, first we need to know where the accident has happened through location tracking and sending a message to one or more of the emergency services. A 3-axis orientation/motion detection Sensor detects an accident and uses GPS to locate the accident place. The integration of map-matching algorithm, 3-Axis orientation/motion detection sensor and GPS data can be used to detect a vehicle accident and the position information can be sent to Rescue Service Centre through SMS alert using GSM for rescuing the accident victims. 3-axis orientation/motion detection sensor detects the collision and map-matching algorithms

integrate Global Positioning System (GPS) data with the road network data to find, identify the correct link on which the vehicle is travelling and to determine the physical location of that vehicle.

2. BACKGROUND

During the past two decades dramatic changes occurred in the lifestyle, the expansion of the highway, number of crashes, deaths and injuries, only highlighting that mobility; transport and safety need to grow together for the infrastructure, especially in major metropolitan areas.

Table1:Number of accidents occurring across various cities in INDIA[3]

S.No	Name of the City	Total Number of			
		Fatal accidents	All Accidents	Deaths	Injured
1	Ahmedabad	226	2135	235	2124
2	Bangalore	791	6490	832	5376
3	Chennai	590	5123	607	4425
4	Coimbatore	264	1131	254	1066
5	Delhi	2104	7260	2153	7108
6	Hyderabad	473	2797	494	2662
7	Indore	383	4961	414	4180
8	Jaipur	414	2000	436	1808
9	Kanpur	558	1413	640	1249
10	Kochi	153	1779	166	1783
11	Kolkata	341	2843	354	2239
12	Lucknow	482	1275	498	709
13	Ludhiana	222	430	227	239
14	Madurai	120	568	120	526
15	Mumbai	609	28424	637	5940
16	Nagpur	301	1548	317	1404
17	Patna	444	1170	444	606
18	Pune	417	199	439	1701
19	Vadodara	180	1335	188	1121
20	Varanasi	234	358	248	126
21	Visakhapatnam	437	1165	460	1804
	All INDIA	119558	499628	134513	527512

Table 1. Shows the number of fatal accidents, all accidents, number of deaths, number of people injured due to accidents across 21 cities in INDIA. It also shows the % of accidents occurred across 21 cities in INDIA. Available data is indicating that the economically progressive states of India are already reporting higher number of accidents, injured people and deaths.

3. PROPOSED WORK

The purpose of the proposed work is to give a vehicle with GPS positioning chip and a GSM chip fitted in an Arduino GSM/GPRS & GPS module SIM908[4] microcontroller and a miniature 3-Axis orientation/motion detection sensor. The microcontroller is fed with an average calculated impact that occurs during an accident. The sensors are positioned at different locations in a vehicle and are connected in a circuit associated with a microcontroller along with GSM and GPS chips as shown in figure 1.

3.1 Architecture diagram

Figure 2 shows architecture diagram of the system. Whenever an accident occurs the impact and vibrations are sensed by the vibration sensor that is 3-Axis orientation/motion detection sensor. These signals are sent to the controller by using an amplifying circuit. If there occurs a rolls over of the vehicle, the angle of the roll over is detected and captured by the micro electromechanical system sensor (MEMS) is given as an input to the microcontroller for further processing. As the microcontroller receives the input, it checks for the impact of accident, in case of roll over the buzzer alarm will be switched ON and the Arduino initiates the GPS. In case of the impact , the arduino detects the impact. If is greater or equal to the average calculated impact that causes threat to human life then the Arduino initiates the GPS. The GPS traces the location of the in terms of coordinates (latitudes and longitudes). It also activates the GSM chip and sends an alert message including the vehicle number, the name of the person to whom the vehicle is registered and the location of the accident which is stored in the microcontroller to the centralized servers and to preset numbers of relatives and friends which were fed by default in GSM chip.
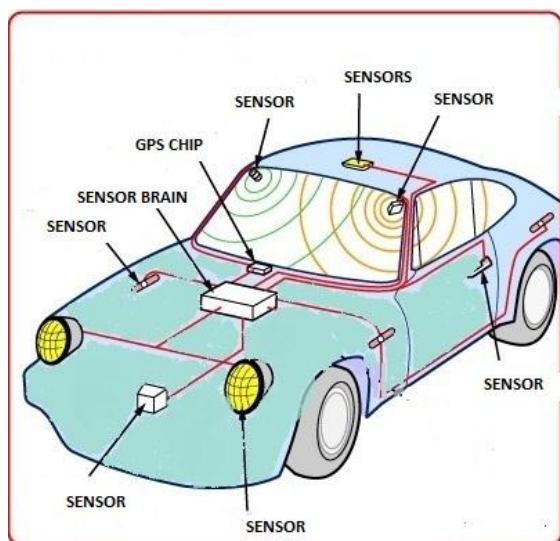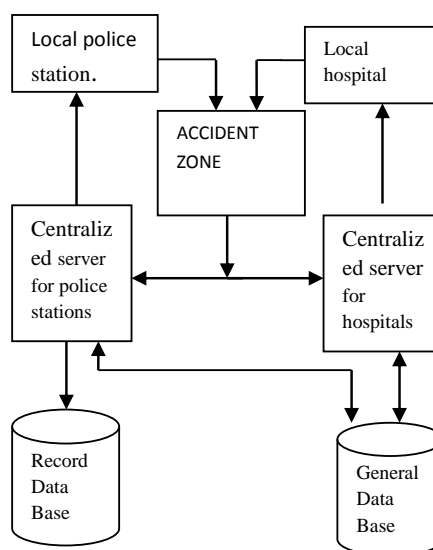

Figure 1: A View of location of sensors

Figure 2: Architectural diagram

3.2 Centralized database for hospitals and police station

The servers will receive an alert message including the latitude and longitude of the accident location. These Servers will be situated in the capital of the state. They will retrieve the location of a local hospital and police station from the general database situated near the accident zone based on the latitude and longitude. If there are no hospitals and police stations in the specified radius of two kilometres, these servers will extend the radius by 5 kilometres. Again if there are

no hospitals and police stations in the specified radius, the server will again extend the radius by 5 kilometres. This process continues until a hospital and a police station is found. Once a hospital and police Station is found, the server will send an alert message to that hospital and police station regarding the location of the accident. The hospital and police station will send ambulance and help to the accident zone immediately.

3.3 General database

The general database will consist of records of all hospitals and police stations in a country. It will include the address as well as location of the hospitals and police stations.

3.4 Record database

As per the statistics, in India it is found that only 10% of the total accidents have been recorded in police stations. The record database will keep a record of all accidents occurring in a country / state and a correct toll of number of deaths occurred in these accidents.

3.5 Flowchart

Figure 3 shows the flowchart of the system. It shows the system is initialization is on when the vehicle starts. If the system is detected abnormal then it is confirmed that accident occurred. The impact of the accident is detected. If the impact is less and does not cause threat or harm to human life then again system initialization takes place. But if the impact is equal to the average calculated impact then the microcontroller activates GPS and traces location of the accident and sends an alert message to police and rescue team.
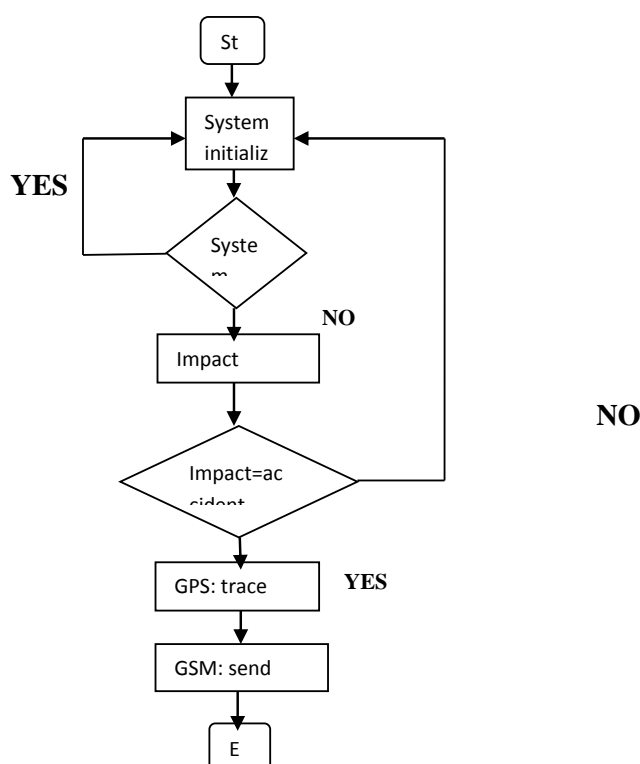
Figure 3: flowchart of sensor based automatic accident tracking system

4. HARDWARE IMPLIMENTATION

Figure 4 shows the design structure consisting of a control unit of arduinoTDGGSM_908. The accident detecting module includes a 3 Axis Accelerometer Sensor MMA 7660FFC[5]. The user interface includes a LCD, and a SMS sending module. When an accident occurs the impact sensor detects the collision impact automatically. If the vehicle rolls over then the roll angle is set by z axis of the accelerometer sensor. An alert signal is sent if the rolling angle is greater the default reference value.

Figure 4: Hardware implementation of sensor based automatic accident tracking system

5. ACCIDENT DETECTION MODULE

The accident detection module consists of a 3-Axis accelerometer sensor MMA 7660FFC with the sensitivity +/- 1.5g and with digitalized output. The MMA7660FFC is interfaced to the arduino microcontroller unit by Inter Integrated circuit protocol. It has a low cost and also has very high shock survivability of 10,000 g. It also has a low current consumption of 0.4 micro ampere and low a power consumption analog voltage of 2.4V to 3.6V and a digital voltage of 1.71V to 3.6V. It also has an auto sleep or wake feature for low power consumption. It can accurately perform Tilt orientation detection.

6. MICROCONTROLLER INTERFACING AND GSM, GPS MODULE

The microcontroller used here is an Arduino microcontroller model-TDGGSM_908. The dimensions of microcontroller are 1.35×1.5 inches. It needs a voltage between 3.2 and 4.2 V and absorbs a current of about 1A. It also has a GPS tracking device that can communicate the location of the accident through SMS. The microcontroller continuously monitors the 3-Axis accelerometer sensor MMA 7660FFC. It can be easily programmed using C language. It takes appropriate inputs from the sensor in form of analog and digital voltages. If the vibrations or impact are equal to accident impact then the microcontroller triggers the GPS and locates the accident. The location of the accident and a predefined message regarding the vehicle number,

the name of the person to whom the vehicle is registered will be sent to the default numbers of his/her closed relatives and doctor stored in the GSM SIM and to centralized servers to avail immediate aid and help.

7. THREE AXIS MOTION DETECTION SENSOR

The 3-Axis accelerometer sensor MMA7660FFC will be located at different locations in the vehicle. This sensor will be continuously analyzing and sensing the vibrations occurring in the vehicle. Figure 5 shows the dimensions of the sensor. The MMA7660FC is a ±1.5 g 3-Axis Accelerometer with Digital Output (I2C). It is a very low power, low profile capacitive MEMS sensor featuring a low pass filter, compensation for 0g offset and gain errors, and conversion to 6-bit digital values at user configurable samples per second. The device can be used for sensor data changes, product orientation, and gesture detection through an interrupt pin (INT). The device is housed in a small 3mm x 3mm x 0.9mm DFN package.
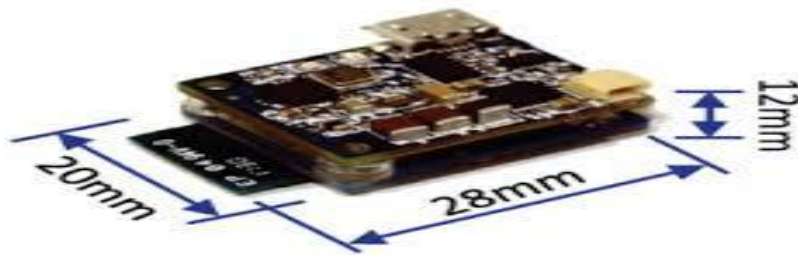

Figure 5: Dimensions of MMA7660FC

8. CONCLUSION

With the advancement of technology in every walk of life the importance of safety of vehicle has increased. In this paper main priority is given to reduce alarming time when the accident occurs, so the injured people could be attended in lesser time by rescue team. This paper gives the design which has advantages of less cost, portability, and small size. The platform of this system is Arduino microcontroller along with, 3-Axis accelerometer sensor, MEMS, GPS, and GSM, interfacing which shortens the alarm time to a large extent and also locate the site of accident accurately. The automatic detection of accident location will help to provide security to vehicles and the lives of people. A high priority is given to lives of people. Thus, this paper provides a feasible solution to traffic and accident hazards and also gives security to the vehicle as well as reduces loss of valuable lives and property.

9. REFRENCES

[1] Salas K Jose, X. Anitha Mary, Namitha Mathew ,"ARM 7 Based Accident Alert and Vehicle Tracking System" International Journal of InnovativeTechnologyand Engineering(IJITEE)ISSN: 2278-3075,Volume-2, Issue-4,March2013.

[2] Samy Sadek, Ayoub Al-Hamadi, Bernd Michaelis, Usama Sayed" A Statistical Framework for Real-Time Traffic Accident Recognition", Issue: 2010.

[3] Singh, A.P*. Agarwal P.K**., Sharma A.**'' ROAD SAFETY IMPROVEMENT: A CHALLENGING ISSUE ON INDIAN ROADS , International Journal of Advanced Engineering Technology "April-June, 2011.

[4] Arduino GSM/GPRS & GPS module SIM908,
http://www.element14.com/community/groups/arduino?CMP=KNC-APAC-ARDUINO

[5]3-Axis accelerometer sensor MMA7660FFC ,
http://www.rockbox.org/wiki/pub/Main/CreativeZENXFi2/MMA7660FC.pdf