Design of motor safety alert system

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Abstract : Every life is important, day by day the number of road accidents are increasing. Many researches are going on regarding the collision detection and avoidance system from obstacles. This paper presents an efficient design to avoid collision and provides safety alert. Here propose a systematic method which includes ultrasonic sensor, proximity sensor, pressure sensor and vibration sensor. When an obstacle is detected the ultrasonic sensor will detect and provides a warning with minimum brake. And the obstacle moves closer, the proximity sensor make the HD camera to get on. Then ultrasonic sensor with maximum brake applied. When the car gets collide the high pressure developed will activate pressure sensor and vibration sensor thus an alert message is to the prescribed numbers (ambulance, police). For safety system also has a buzzer and led which will make noise when collides. Also add the IOT module receive information request message from server and upload the matched information to server.

***IndexTerms* – Ultrasonic sensor, Proximity sensor, Vibration sensor, IOT.**

I. INTRODUCTION

Now a days the vehicle accident rate has been increasing day by day. With such a high number of accidents per year, safety is a critical concern. In this 20th century various kinds of vehicles have been introduced day by day to provide convenience in human life and to the development of new technologies to makes the vehicle running safer and convenient. In recent years many countries have been characterized by a strong emphasis on safe driver assistance system designed to prevent traffic accidents.

Driving at a too short of safety distance is a common problem in road often with traffic accidents as a consequence. The drivers always tend to drive too close to the neighboring vehicle because they are unaware of the distance required to maintain safe stop for the vehicle at running speed.

When collision happens due to obstacle it is necessary to collect information related with collision from the spot. It is very difficult to collect the information from the spot and also have to asking for the observers who happen to pass. To get an advancement from all these here designed a system as safety alert system. It provides safety and also alert the responsible authorities and provide information related to the accidents. Recently several black box functionality have been reported as ADAS (Advanced Driver Assistance System) and OBD (On Board Diagnostic) systems. This system several additional functionalities are provided. It analyses and extract the key information of surrounding vehicles while driving. The system envisioned in an automatic collision detection and warning system relying on GPS/GSM module. In the case of an accident the system detects it using the fact that the vehicle would be suddenly decelerated in such condition. Main aim of this work is to provide safety to the vehicle so here an arduino uno board is used for cost effective and also for easy understanding. Here GSM/GPS module is used to track the vehicle exact location and send alert message. To detect the obstacle proximity sensor, ultrasonic sensor, vibration sensor and pressure sensor are used. When an accident happens, sensors will be active and collected information sends to arduino. At the same time, GPS and GSM modem will also active which are interfaced to the arduino. Thus with this system information is send to police station, ambulance and friends etc. and saves the lives in emergencies. This work was initiated to develop a device for continuous safety distance monitoring and alerting the drivers by applying minimum brake or speed maintaining whenever their safety distance decreases below a safety level. The result is a working prototype of low cost device and reliably performs task automatically with no required human intervention.

A. Functional Requirement and conceptual Design

Prior to starting the development of the concepts the functional requirements of the system were set.

- The device has to be able to measure the instant velocity of the host vehicle with sufficient range sufficient accuracy to be able to operate at motorway speed limits.
- The device has to be able to measure the instant velocity of the host vehicle with sufficient accuracy to calculate the required safety distance.
- The device has to be alert the driver of the trailing vehicle whenever their safety distance to the host vehicle is too short.
- The device has to alert the driver of the host vehicle of a possible rear and collision
- The device has to be able to record all the ride parameters such as time, location, velocity, speed, acceleration etc.
- The device has to be able to record the collision obstacle when an accident occurs.
- The device has to be able to provide alert message when gets collided by an obstacle.

II. LITERATURE REVIEW

All existing vehicles contain many solutions for vehicular safety. In 2018 [1] "Internet of things in vehicle safety-obstacle detection and alert system" by D.Umakrithika, P.Pushparani and M.Valan Rajakumar says IOT is network of physical devices, vehicles and other embedded with electronic software. This article describes about the obstacle detection and alert system. It uses a RADAR and image processing system. When an obstacle is found, it uses in built algorithm to detect an obstacle on road. Then uses the minimal vehicle parameters such as speed, steering angle etc are to be controlled. The located obstacle are marked by the detection system and uploaded to cloud from time to time. The cloud server processes data from different vehicles, it is compared and finalizes the real obstacle at the location based on algorithm. This alert the driver about the obstacle on the road when driver near to obstacle. As compared with existing system which only have road sign indication for obstacles. This system has some advantages that Google maps data have option to find road obstacles. But this system only provides audible and visual alert about road obstacle which will not provide any prevention from obstacle collision. It also provides speed alert when it falls from above and below prescribed level within definite time based on the algorithm. It describes obstacle detection and alert system, both incorporated as single system for obstacles such as speed breakers, barricades on road using IOT.

In 2010 [2] "Intelligent safety warning and alert system for car driving" by Shih Nan Lu and H Sein Wein Tseng says happenings of accidents due to drivers fatigue. We all are hearing that many accidents are occurring due to driver's fatigue after a long journey of travel. The bad visibility of road in night, driving in heavy rain etc. may cause road accidents and loss of life. It provides a sleepiness warning system. The developed technology uses a wide bandwidth technique which mainly focused on the driver's eyelid width, visibility of pupil, the motion of head etc. to understand the sleepiness of driver. They develop an algorithm to detect the driver sleepiness and provide warning signal to awake the driver before falling into sleep. Thus accident can be avoided. It also provides an intelligent night vision system. It uses infrared camera to monitor road condition and is displayed on the LCD screen of the car. Thus driving at night or heavy rain is made easier which is an advantage. But the system only provides alert about the physiology of the driver, will not provide any obstacle detection.

In 2017 [3] "Intelligent safety information gathering system using a smart blackbox" by Chanjin Kang and Seo Weon Hoe uses method of gathering information using an intelligent black box system. In this system add several additional functionality that extracts the information of the surrounding vehicles by using recognition engine which extracts the licence plate number and GPS of passing vehicles. Also a communication engine is added to receive information request and record time of driving route information. When the server broadcasts information of some specific time and place, intelligent blackbox system receives that request message from the server, matches the time and place tag and then send the matching information to the server. They propose another thing when accident is occuring while driving that time accident vehicle to send the information to the server.

III. METHODOLOGY

The selected concept of the device is based on an arduino board and includes an ultrasonic sensor for distance measurement, a vibration sensor, a proximity sensor, a GPS module for tracking the vehicle, a GSM module for sending alerts as text message, a pressure sensor and a buzzer for warnings about the collision. It is powered from a separate battery. A HD camera is provided to record the collision obstacle; it records the data on the built in memory card.

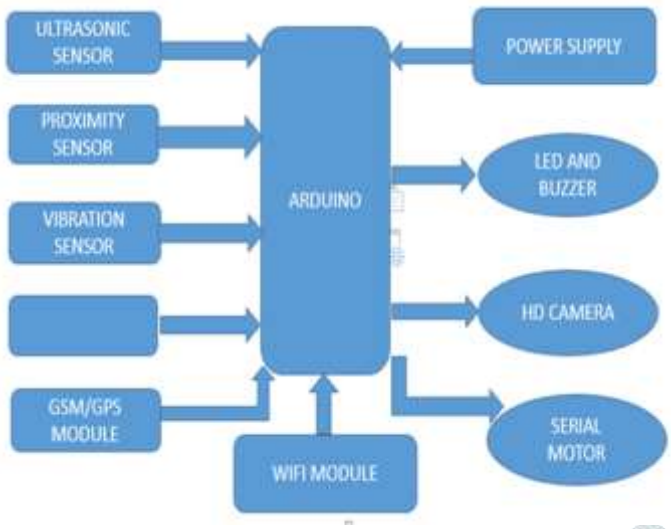
A. Selection of Components

Based on the versatility and lower power consumption the first opted component was the arduino uno board. Then selected carefully the sensors needed. First selected sensor was ultrasonic sensor. The test were started with ultrasonic sensor as is used in vehicles with adaptive cruise control. The other sensors and the GSM/GPS module are selected for the requirement of prototype construction.

B. System Layout

The core components of the system are shown on the system schematic diagram. It includes Arduino Atmel used as main controller. The system is made for the accident alert system. The whole system is to be implemented in the vehicle itself. When an obstacle is detected an alert with minimum brake is applied by the ultrasonic sensor.

When the obstacle moves closer the ultrasonic sensor will provide maximum braking and the proximity sensor will get active for the HD camera to get alert along with vibration sensor. It measures the certain intensity of shocks and vibrations. So it is detected to the arduino. The demand for more auto safety features and better crash rating systems has increased with the increasing number of c rashes and the fatalities and injuries related to these crashes. Automobile manufactures have also begun incorporating more sophisticated technology into their design. This technology continuously evaluates any obstacles on the road to prevent damage caused by an accident.



Block diagram of motor safety alert system

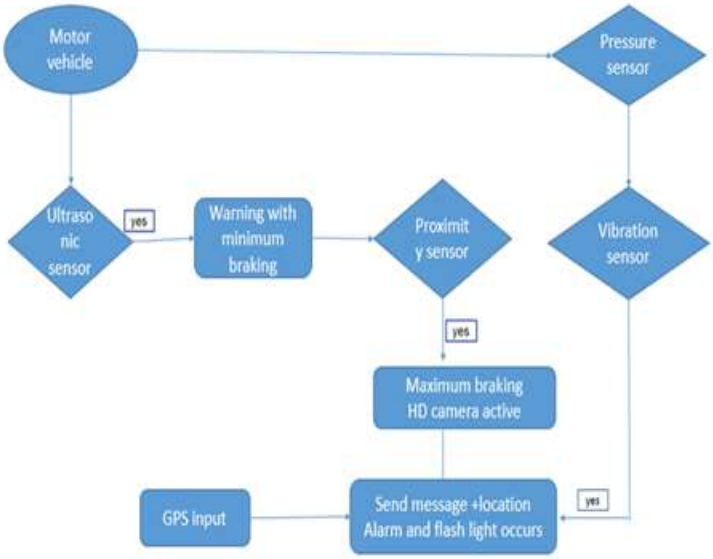
Arduino is used for controlling whole the process with a GPS receiver and GSM module. GPS receiver is used for detecting coordinates of the vehicle, GSM is used for sending the alert SMS with the coordinates. Collision sensor is used for detecting the obstacle coming closer. The collision sensor first provide an alert with minimum braking about the obstacle.

When obstacle moves more closely to sensor maximum braking provides and the proximity sensor used will activate the HD camera for capturing the image. Now, whenever there is an accident the pressure sensor and the vibration sensor gets activated with flashing light gets on. These values read by arduino and checks. The connections of the prototype were made using readily available cables and connectors in order to avoid physical alterations.

C. Software Architecture and Decision making Algorithm

The first step of the software setup was getting and installing the operating system for the arduino ide computer. The selected and downloaded arduino library files and programming codes for each sensors which is available in various sites. Then error checking for each code is done. After the compilation process the sensors are connected to arduino board one by one with the required connection instructions. First ultrasonic sensor is connected to the board and compilation is done. Making the codes error free by adding appropriate library files and uploaded to board by using the USB cable connected to the arduino board. The serial monitor is chosen and the connection to the sensor was tested by sending command strings and receiving the response. Then the obstacle distance in centimetre is shown on the serial monitor. Similarly other sensors are also connected and tested by sending command strings and receiving the response.

The GPS module was tested by connecting it to the board and then in the serial monitor by sending the AT (attention) command to initiate continuous operation and receiving the NMEA format output. After the successful completion of arduino board and sensor connection. The sensors data are uploaded in the cloud storage we chosen “thingspeak” software. For this we had opened an account in thingspeak with necessary channels created. Then the channel keyand the URL read key are given to the arduino programming codes by providing necessary editing. Then each sensor datas are uploaded in the cloud storage showing the necessary graphical notations.



Flow chart of motor safety alert system

D. Testing prototype and upload to cloud server

The power consumption of the entire system under load was again tested. It was found that the steady electrical current draw of the entire system on the 5v dc output of the regulator never exceeds 0.8A that is need to keep a linear voltage regulator.

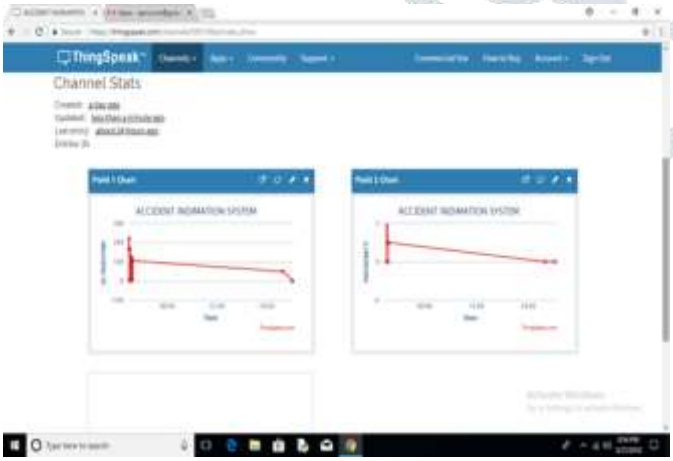
Obstacle locations that are coordinates stored in memory are uploaded to cloud server from time to time using IOT infrastructure.

- Receives and stores obstacle location and details.
- Consolidate and group closer GPS coordinates of obstacles

Cloud server determines that there is actually an obstacle on the road using GPS coordinate.

IV. RESULT AND DISCUSSION

It is an innovative idea which, when implemented to its full potential can be very vital to our society and can be very beneficial to a wide range of drivers. This implementation included a prototype with an interface that showed its working and extent to which it can be implemented. The description of all modules is provided which, when integrated provide a wide variety of functional requirements which include getting the location of the car, and informing respective authorities of a crash. Also the interface which is represented through a website is user friendly and provides the user with only the necessary and useful data that is required. As seen through our graph snapshot, we are able to receive data from our ultrasonic sensor, vibration sensor and proximity sensor through the GSM module via cloud server and have displayed it in the form of a chart to indicate the car acceleration over a period of time. The sample screen shots are given below.



V. CONCLUSION

Motor safety alert system is designed explicitly for motor vehicles which can be most useful for accident prevention. It's low cost, power efficiency system by which the action time can be minimized and exact location of an accident can also be defined with GPS service and also the information regarding accident can be send to particular contact numbers through GSM module. Because of the flexibility the system is very much compatible to any kind of vehicles. The ultrasonic sensor and proximity sensors with cameras can be added so that the product can anticipate an accident and can control the car to avoid an accident before it occurs. This

product can later be expanded to many industries, mainly logistics where we can use Geo fencing to assign a particular route to the delivery and the owner comes to know if the vehicle is going off route or has faced an accident.

References

[1] D.UMAKIRTHIKA, P.PUSHPARANI, M. VALAN RAJAKUMAR (2018)", IJESC ISSN:2319-7242 VOLUME 7 ISSUE 2, PAGE NO. 23540-23551

[2] SHIH NAN LU AND HSEIN TSENG (2010) "INTELLIGENT SAFETY WARNING AND ALERT SYSTEM FOR CAR DRIVING" TAMKANG JOURNAL OF SCIENCE AND ENGINEERING, VOL. 13, NO. 4, PP. 395404

[3] CHANJIN KANG, SEO WEON HEO (2017) "INTELLIGENT SAFETY INFORMATION GATHERING SYSTEM USING A SMART BLACKBOX", IEEE INTERNATIONAL CONFERENCE ON DOI: 10.1109/ICCE.2017.7889294

[4] C.V.ROJA, R.REVATHI, R.SHILBA SHANTHA KUMARI, BATTULA ASWINI,U.VASUDEVAN (2015) "INTELLIGENT SAFETY USING SMART BLACKBOX", SSRG INTERNATIONAL JOURNAL OF ELECTRONICS AND COMMUNICATION ENGINEERING (SSRG-IJECE)-VOLUME 5 ISSUE 3–MARCH 2015