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Cell Phone Usage While Driving Avoidance with GSM-RF Based Accident Emergency Alert System

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Abstract: The significant rise in use of cellular phone leads to increase in road accidents due to use of cell phone while driving, still no research has been carried out to find the number of drivers using cell phone involved in road accident and very limited efforts has been carried out to prevent accident due to cell phone usage. So in this project we are providing a solution to this project in which a mobile stand where driver should have to place his cell phone. If the driver doesn't do so then the microcontroller starts its working accordingly and tend driver to stop the car and then continue the conversation on cell-phone, which leads to the least chances of happening of an accident. In another case if road mishaps took place, this project sends emergency message to the rescue teams and surrounding people to save the life of victims.

Keywords: Mobile Stand, Microcontroller, GSM Module, RF.

I. INTRODUCTION

Talking on cell phones while driving distracts the driver and he fails to maintain the required attention on driving. Hands-free phones can also distract drivers, but the current evidence suggests that hand-held phones pose a greater problem. This risk also extends to pedestrians. So to avoid this problem and with the aim of preventing such accidents, it is proposed to develop a highly efficient automatic system for detection of usage of cell phone by driver which helps in eliminating the risk of accidents from occurring, at the same time ensuring that the user does not miss any emergency call.

However, if accident happens then the emergency messages initiative aims to obtain a very fast reaction from the emergency services for such critical or emergency conditions. This may reduce the probability of death in road trips. By using the current emergency message system from the eSafety, the emergency services operating from the Public-safety Answering Point (PSAP) can instantly identify the vehicle's location by GSM tracing and establish a phone call to evaluate the seriousness of the accident. This project describes a more advanced emergency message (eMsg) approach that provides the emergency services with enriched information about the state of the car. Also suddenly activation of RF system after accident helps to inform nearer vehicle for the indication of accident condition for getting quick help. This paper covers three systems as Cell-Phone Avoidance Alert System, GSM Based Accident Alert System, and RF Based Accident Alert System.

II. LITERATURE REVIEW

The major problem in existing airbag systems have explosive firing, and have high contact forces resulting in head and neck injuries. Front bumper sensors can be used for both airbag deployment and pedestrian protection systems [1].

The work carried by Acharya D suggest, [2] the objective of their work is to develop a general purpose automatic emergency notification system for vehicles using various sensors that will monitor the vehicle and in the event of a crash, automatically report all possible information to the EMS providers.

Paper [3] reports the use of an automated collision notification device in vehicles that can greatly reduce the time between crash occurrence and notification of emergency medical services. An interpolated map of the sampled RSSI values suggests that cellular coverage in Erie County is adequate to support the automated collision network technology [3] & [4].

The work done by Hampton C. Gabler [5] reports on a research effort which seeks to dramatically reduce Emergency Medical Services response time by developing and testing an Automated Crash Notification System which automatically transmits the location and severity of a crash to EMS personnel.

Dr. Chan Lee proposed a wireless token ring MAC protocol [6] for platoon vehicle communication, in which all participating vehicles formed a group and drove cooperatively.

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Prof. Zing Xu [7] discusses a vehicle to vehicle Location-Based Broadcast communication protocol, in which each vehicle generates emergency messages at a constant rate. Message forwarding can help warning message reach vehicles beyond the radio transmission range. The authors propose a multi-hop broadcast protocol based on slot reservation MAC. Motion properties of vehicles are used to help with message relay. Two protocols to reduce the amount of forwarding messages were proposed.

Rajesh Kannan Megalingam [8] suggested a method by using Accident Detection and Reporting System which can be placed in any vehicle used a sensor to detect the accident. The sensor output was monitored and processed by the PIC16F877A microcontroller. The microcontroller took decision on the traffic accident based on the input from the sensors. The RF transmitter module which was interfaced with the microcontroller would transmit the accident information to the nearby Emergency Service Provider. This information was received by the RF receiver module at the `service provider' control room in the locality. The service provider could use this information to arrange for ambulance and also inform police and hospital.

There are active efforts involving wearing special equipment when driving to detect driver distraction has been developed. Further, Kutila et al. proposed a camera vision system. The system is more suitable for in-vehicle environments compared to its predecessors; it did not take the presence of hand-held devices into account. The adverse effects of using a phone on driver's behavior have been identified. These systems include Quiet Calls, Blind Sight, Negotiator, and Lindqvist's systems. They assumed context information of the device and prior knowledge of the phone used by the driver [9].

III. THEORETICAL STUDY OF PROPOSED SYSTEM

To achieve the desired goal I have manufactured a system whose block diagram is shown below in fig. 1. Block diagram consist of Microcontroller, sensors, GSM module, buzzer, relays, transmitter and receiver module. Sensors are fitted around the car body so as to send information to the microcontroller. Microcontroller used in this system is ATMEGA16, decision making element in this system. Encoder-Decoder for encoding and decoding process of RF signal.GSM module for sending message in emergency condition.

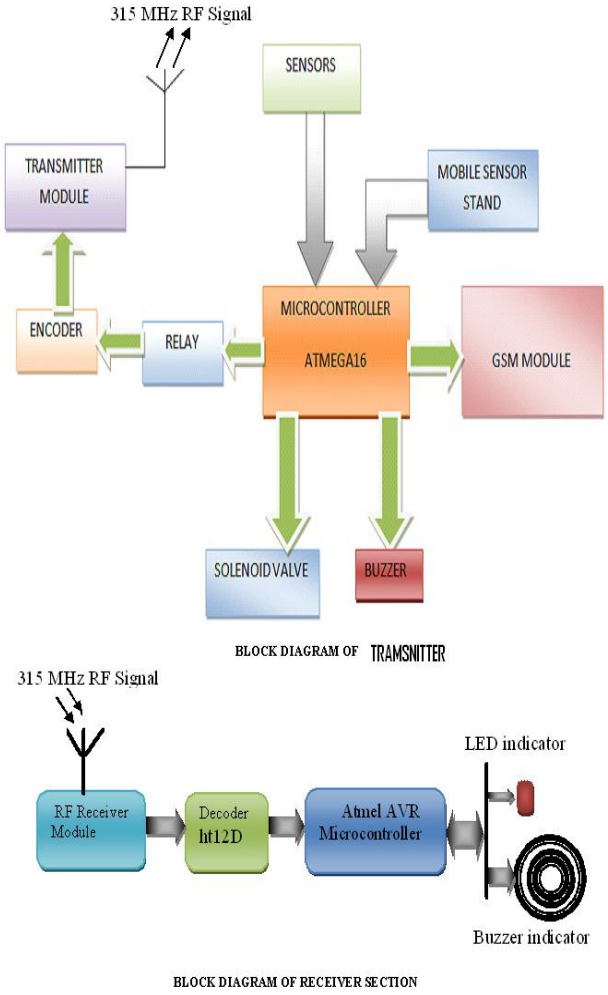

Fig. 1 Block Diagram of Proposed System

IV. DESIGN AND IMPLEMENTATION

For designing of system, there is a need of hardware components like Resistors, Capacitors, Diodes, Relays, RF TX/RX, Microcontroller, GSM module, etc. and also software program to operate microcontroller as per requirement.Where software program which is developed by Embedded C programming is installed in the microcontroller with the help of compiler so as to operate it in required way by which it can handle the operation of hardware components. Implementation consist of designing of transmitter section and receiver section as shown below in fig. 2 & fig. 3 respectively

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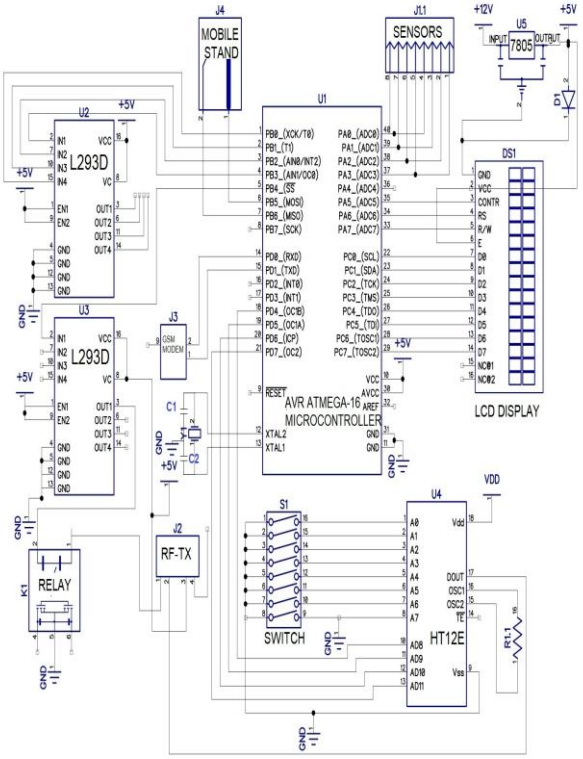

Fig. 2 Transmitter Section

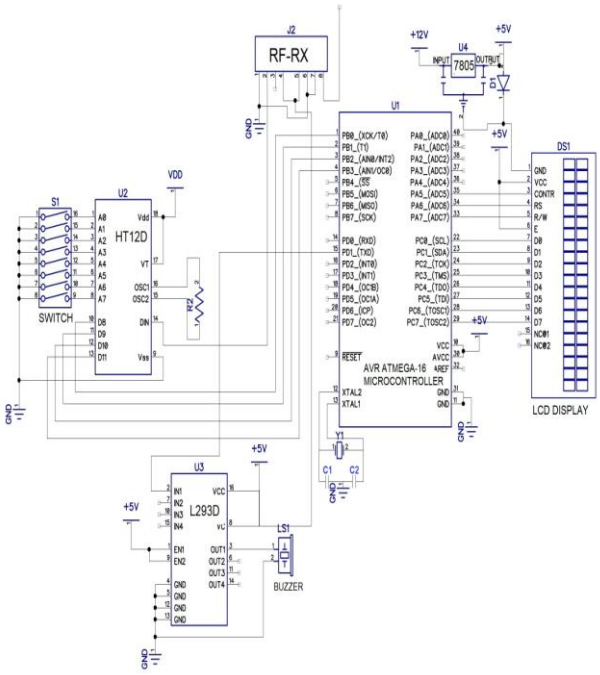

Fig.3 Receiver Section

V. DATA FLOW DIAGRAM

The operation of whole project has a specific pattern according to the action takes place of which software has developed. The whole operation takes place according to the following flowchart as shown below in fig. 4.

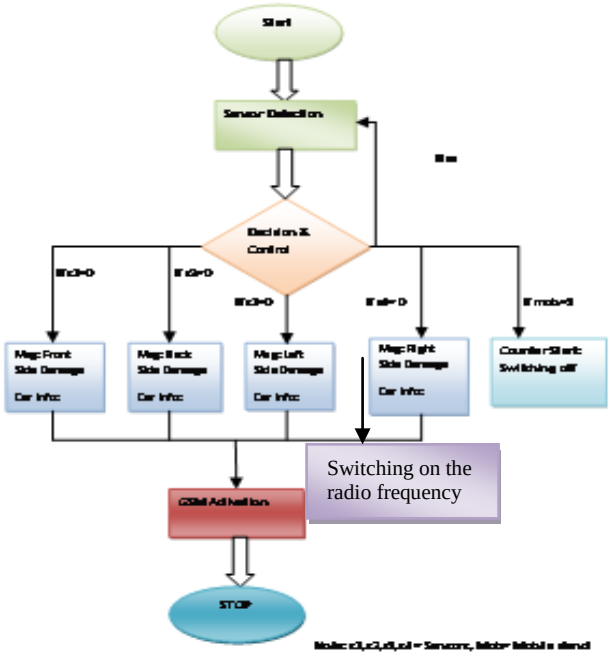

Fig.4 Data Flow Diagram

VI. WORKING

Circuit diagram and hardware implementation shows the three major parts of whole system. Cell phone detection stand system, GSM and RF based accident alert system which operates simultaneously when driver is into the car or vehicle. But still its working is different and independent to each other. To understand the specific way of its working, its performance if divided in to three cases. First case is for starting situation when driver came into the car. Second case for GSM activation when accident happened and third case for RF module activation with GSM activation in accident condition.

Case 1:-

In that system, normal pressure switch are used as a sensor element for detection of cell phone and motors are used to rotate the wheels of car. Where in real time, USB chord will be used to identify the cell phone whether it is driver's cell phone or not and solenoid valve will be used to control the

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supply of fuel of car so as to stop this supply when cell phone is not on stand. So before start the ignition of car, driver should have to put his cell-phone on the mobile stand on dashboard as shown below in fig. 5 by which the micro-controller sends signal 1 to motors or solenoid valve. Motor remain in stop condition if cell phone is not on stand. The solenoid valve is fixed between the supplies of fuels. Until the valve received signal 1, it permits fuel to reach at the engine so that the car get started and ready to drive. While driving, if cell-phone ranged and driver received it without stopping his car, motor stops or solenoid valve get closed by getting 0 signals. Closed valve stop the fuel to go into engine so as to slow down the car and stop it.

Fig. 5 Mobile Stand On Dashboard

If driver lost his mobile and he need to drive the car, he can use touchpad as shown below in fig. 6 to enter the password so as to start the engine. This touchpad is connected via mobile stand which sends the password signal to microcontroller by which microcontroller permits driver to drive the car.

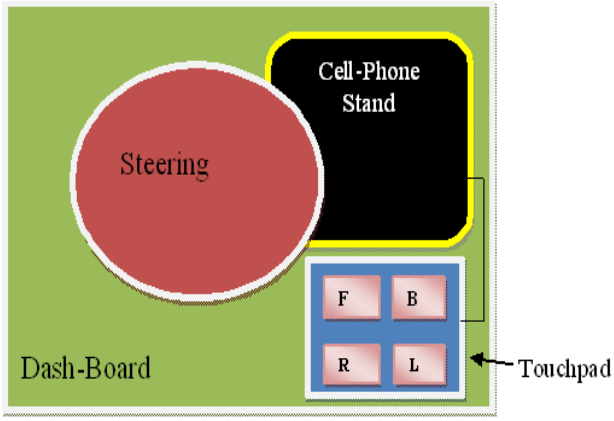

Fig. 6 Touchpad for password

Case 2:-

Sensors are attached inside the car in four directions as shown in following fig. 7. If there will be accident occurs, then sensor will be damaged and controller will consider a logical zero in the region of accident side and send a signal to the microcontroller for processing the message to the control room regarding the accident situation. For automatic emergency messaging system we used GSM modem. The GSM network is used to provide communication from one place to another. Using the GSM module consists of a Mobile Station (ME and SIM). The commands used to provide communication were AT commands. The AT commands specify the GSM technology and are related to SMS service. If an accident happens, the GSM modem is used as the automatic emergency messaging system. When the pressure sensor senses the pressure or change in g-forces in the vehicle at the time of accident, we set the flag of the microcontroller unit (MCU). MCU set the pin of LED for data indication. If LED is ON that means Vibration or pressure sensor has detected the crash. The MCU sends a command to the GSM modem to send a pre-stored message to a predefined telephone number, which may be a SOS number.

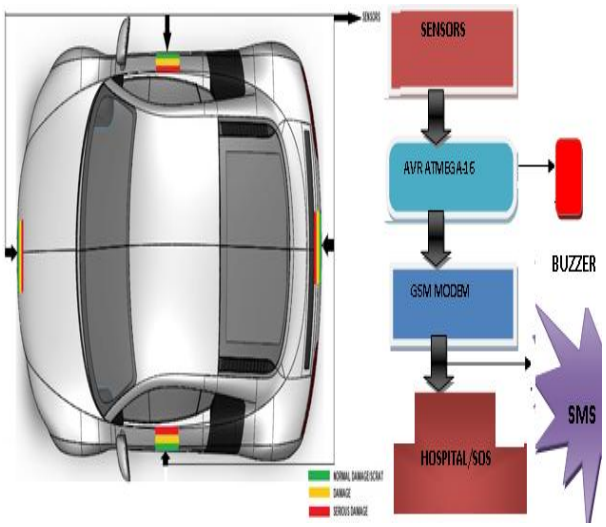

Fig. 7 GSM Based Accident Alert System.

Case 3:-

When the accident is happened, sensor will sense that vibration and gives its signal to AVR micro-controller which decides whether the vibration is serious or not. If the vibration is really serious it activates both GSM module and RF transmission module together. GSM module will start its work by sending an emergency message to control room. At the same time RF transmission module gets activated and it

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will also start transmission of RF signal of 315MHz within an approximate 50 meters radius area.

At first, after the detection of sensor's signal, micro-controller sends the signal to relay. As we know that the relay is an electrical switch, relay get switch ON and forward this signal to the encoder. Encoder will encode that signal in order to reduce the possibility of noise in the signal during transmission. And the signal gets transmitted. During that time the buzzer which was connected with RF transmitter along with micro-controller start alarm loudly to get attention of nearer place people towards itself. RF transmission module is independent from that buzzer and continues its work by transmitting its RF signal.

This transmission of RF signal will never stop until any person makes the module OFF. The other cars which already having the same circuit will receives that RF signals by RF receiver. This received signal is then forward to the decoder which decodes the signal in order to reduce noise and detection correctly as possible. After detection of signal, the LED indicator start glowing and also BUZZER connected to decoder start alarm to indicate that the accident is happened within 50 meter radius area. So this system inform other people for help to accident victims quickly if there is delay in providing emergency service by Control Room or Police.

Displays screen shots shows whole working of this system before damaging in accident. These displays are in lower front dashboard to the driver. Display at transmitter section shows the normal condition messages and display at receiver section shows the messages about mobile stand condition and accident detection of other car or vehicles.

When cell-phone is not on stand or removed from stand, below message get displayed for the driver as shown below in fig. 8.

Fig. 8 LCD Screen Shot During Absence Of Mobile On Stand

When driver put his cell-phone on the stand and because of absence of mobile, if he entered the password, system will permits driver to start the ignition of vehicle by showing message at receiver section. The LCD screen will look like fig. 9 shown below.

Fig. 9 LCD Screen Shot During Presence Of Mobile On Stand.

In normal condition of car itself, normal message is shown to the driver as shown below in fig. 10.

Fig. 10 LCD Screen Shot During Normal Condition

When accidents get happened with others, this display will show the message like fig. 11 as shown below along with buzzer alarm and red LED lighting at receiver section.

Fig. 11 LCD Screen Shot During Accident Happened To Other

If accidents get happened with the car, obviously any one or more sides get damaged, so by detecting this damageable pressure, sensor will send signals to the microcontroller to activate GSM and RF module. After activation of this both systems, requesting for help get started as shown below in fig. 12.

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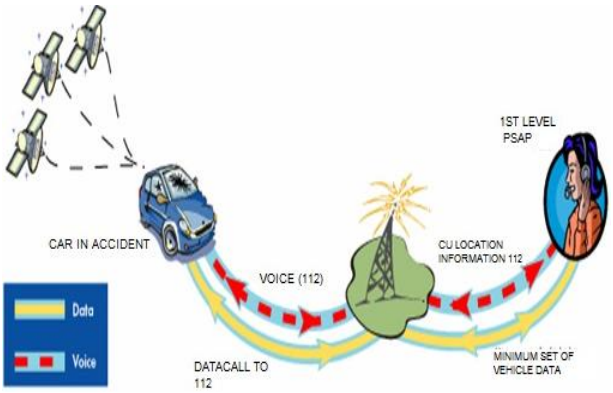

Fig. 12 Alert Data transmission

The text-data link of eMsg is required to be GSM standard. As shown in above figure when a car accident happens, the device initiates eCall to the Public Safety Answering Point (PSAP). The Wireless connection consisting of voice and data is carried through the mobile network (GSM) recognized by a Mobile Network Operator (MNO). The voice communication can provide the PSAP operator more details about the accident, however, regardless of if a voice communication is possible or not, an MSD consisting of information about the accident will still be sent to PSAP automatically. The PSAP should acknowledge the eMsg generator when an MSD has been received. After acquiring the accident information from the eMsg generator, the PSAP can then deploy ambulance and hospital preparation more efficiently.

Before transmission of emergency massage, for a fraction of seconds this message processed by the microcontroller which displays this message on the display of transmitter section as shown below

When accident happened from front side, display shows this message which is to be transmitted via GSM module, Similarly, display will displays the messages as per side affected and at the GSM receiver side message will displayed as shown below fig. 13.

Fig. 13 LCD Screen Shot During Accident Happened And Mobile Message

VII. CONCLUSION

The chance of accidents happened due to talking on mobile while driving can be minimized by making the use of mobile stand connected to the solenoid valve of engine which controls the real time fuel flow to the engine of car. Also in case of road mishaps to provide the real time help to the victims we have designed a user-friendly kit which provides the real time information about the accident to the victim's relative as well to the nearby passing vehicles and surrounding people for proving a quick medical help. At the same time our system provides the accident information to SOS and Police Control room. The System offers a wide communication bandwidth with the car control system to change data and information and new functional modules can be easily added to the system to upgrade and enhance it. Because of the flexibility of embedded system, this system is very much compatible to any kind of four wheeler. Overall our system is very much affordable to a common man which can be easily implemented.

VIII. FUTURE SCOPE

One approach to eliminating the delay between accident occurrence and first responder dispatch is to use in-vehicle automatic accident detection and notification systems, which sense when traffic accidents occur and immediately notify emergency personnel. These in-vehicle systems, however, are not available in all cars and are expensive to retrofit for

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older vehicles. Thus by using smart phones, such as the iPhone and Google Android platforms, can automatically detect traffic accidents using accelerometers and acoustic data, immediately notify a central emergency dispatch server after an accident, and provide situational awareness through photographs, GPS coordinates, VOIP communication channels, and accident data recording. By increasing the RF signal range to covered more area and using of directional antennas with RF module can help any person to send emergency signal or to detect accident victims and his/her perfect location for quick action.

REFERENCES

[1] Paul Hurwitz and Winfield Hill, "The Art of Electronics" Cambridge University Press, New York, USA, 2010A .Vibration sensing based automatic vehicular accident notification system, vol.35, no.3, pp.349-360, 2003.
[2] Acharya D, utomated crash notification via the wireless web:, System design and validation", vol. 19, no. 6, pp. 1048-1059, 2011.
[3] Mohan R Akella,Wireless vehicular Accident Detection and Reporting System, vol. 95, no. 2, pp. 388-396, 2007.
[4] L. Nelson, S. Bly, and T. Sokoler. Quiet calls: talking silently on mobile phones. In Proceedings of the SIGCHI conference on Human factors in computing systems (CHI'01), pages 174–181, New York, NY, USA, 2001.
[5] Hampton C Gabler, Bergasa, J. Nuevo, M. Sotelo, R. Barea, and M. Lopez. Real-time system for monitoring driver vigilance. IEEE Transactions on Intelligent Transportation Systems, 7(1):63 –77, 2006.
[6] Dr. Chan Lee, Car 2 Car Communication Consortium. (2010, May) Car 2 Car Communication Consortium, Website. [Online]. http://www.car-to-car.org/
[7] Prof. Zing Xu: V-V location Based broadcast communication, Automated crash notification via the wireless web: system design and validation", vol. 19, no. 6, pp. 1048-1059, 2011.
[8] R. Kannan Magalingam. "Optoelectronics Circuit Manual" BPB Publication, New Delhi, pp144-146, 1993.
[9] M. Kutila, M. Jokela, G. Markkula, and M. Rue. Driver distraction detection with a camera vision system. In IEEE International Conference on Image Processing (ICIP '07), 16 2007

BIOGRAPHY

Prof. Abhay Premdasji Bagade has done his engineering from Priyadarshini College of Engineering & Architecture, Nagpur under R.T.M. Nagpur University, MH in 2006. Later on in 2011 he has completed his M-Tech in Electronics from Bapurao Deshmukh College of Engineering, Sevagram, MH. Presently he is working as Assistant Professor in Electronics & Telecommunication Department of Bapurao Deshmukh College of Engineering, Sevagram. He is a lifetime member of IETE. He has presented and published many papers on communication area.