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Road Safety and In-Vehicle Monitoring System

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ABSTRACT

The main aim of this paper is to design and implement Car black box- In Vehicle Monitoring System. This paper is designed to observe the real time driving parameters such as speed, temperature, pressure and many such parameters which would be displayed in the LCD. The whole system is integrated onto a single chip which is known as system on chip (SOC), which would help in reduced space and low power consumption Hence this In-Vehicle Monitoring system is used to record information related to accidents. It records driving data , visual data , collision data and position data before and after the accidents , so that it can be used to analyze the accident easily. It can be used not only to reconstruct what happened before an accident by insurance agents and police but also to improve vehicle design, roadway design and emergency medical service by automakers; government and hospital .We have included an RFID reader, where the intended drivers are allowed to access the vehicle along with a valid DL. In The main aim of this paper is to design and implement Car black box- In Vehicle Monitoring System. This paper is designed to observe the real time driving parameters such as speed, temperature, pressure and many such parameters which would be displayed in the LCD. The whole system is integrated onto a single chip which is known as system on addition to the basic function, the In –Vehicle monitoring system is equipped with GSM/GPRS communication system to send accident location information to his/her family members/care taker to nearby police stations. Therefore the drivers who want help can receive service quickly by rack car, police and hospital ambulance.

Key words: Car Black Box, GPS, GSM, RFID reader, System on Chip (SOC).

1. INTRODUCTION

Road accidents are one of the major causes of increased death rate globally. According to the recent census, it states that 1.2 million people had sacrificed their life in road crashes each year and nearly 50 million people are injured. And if present trends continue, Road accident injuries are predicted to be the third leading contributor to the global burden of disease and injury by 2020.

According to census, it shows the people under the age of 15-44, they lose their life and the disability burden for this age group accounts for 60% of all DALY's (Disability adjusted life years). And since road accident injuries affect mainly males (73%), this burden is creating enormous economic hardship due to the loss of family bread winners. The world bank estimates that road accident injuries cost 1.5- 2% of the gross national product (GNP) of developing countries. WHO report shows that nearly half of the people killed in road accidents around the

world are pedestrians, passengers in public transport, income and middle income countries motorcyclist as shown in Fig.1.

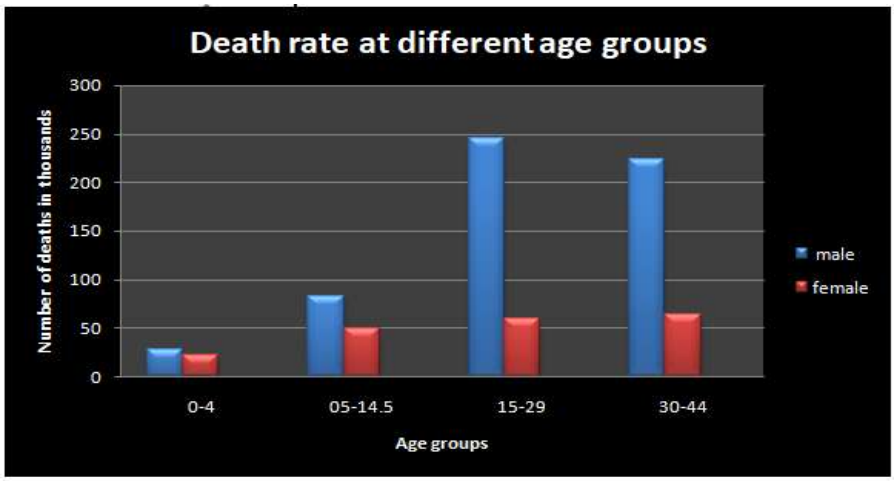

Fig 1.WHO report

Road accident injuries affect all age groups, but their impact is most striking among the young. Below table shows the rate of death rate at different ages. To overcome this problem, the In- Vehicle monitoring system can be used to prevent the road accidents and thus decrease the rate of death globally. Thus this system can be used as a preventive measure against road accidents.

2. EXISTING SYSTEM

Road accidents are one of the major causes for increased death rate globally. In this system many IC's for car black box is implemented on to a single chip which would result in reducing its size, power consumption and the cost . Hence this paper describes the embedded controller for car black box using SOC (System on Chip) technique. System on chip contains various sensors such as speed sensor and alcohol sensor along with GPS and GSM for communication. Car black box system consists of devices which is used to store and record the information's such as presence of obstacle around the vehicle, alcohol content and exact location of the vehicle. Along with its basic function, a smart phone is used to get the snapshot which are related to accidents, which be would be sent to police station servers for crime investigation. In this existing system, the whole system has been divided into two junctions. In the first junction it is analyzed that how to detect and collect the information from the vehicle. The second junction works on how to transfer the data to the user in a effective way. This system uses various types of sensors such as seat belt detection, Lane detection and CAN failure. It also uses GPS and GSM system for communication. The major objective of this paper is to focus on monitoring of real time driving and also stores the monitored data in cloud. This information helps the crime investigations, as well as insurance company to find out the cause of the crash. This system uses Android Smartphone along with android application to provide features for accident monitoring. Along with video monitoring, other features such as speed tracking, anti theft and navigation are also provided in this system.

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3. PROPOSED SYSTEM

The propose system uses 11 sensors , switches to determine brake and seat belt fault and additionally an fan and fire extinguisher is provided to use it on the time of emergency. An RFID reader is used to read the valid DL of the driver. The block Diagram of the proposed system is as shown in Fig 2.

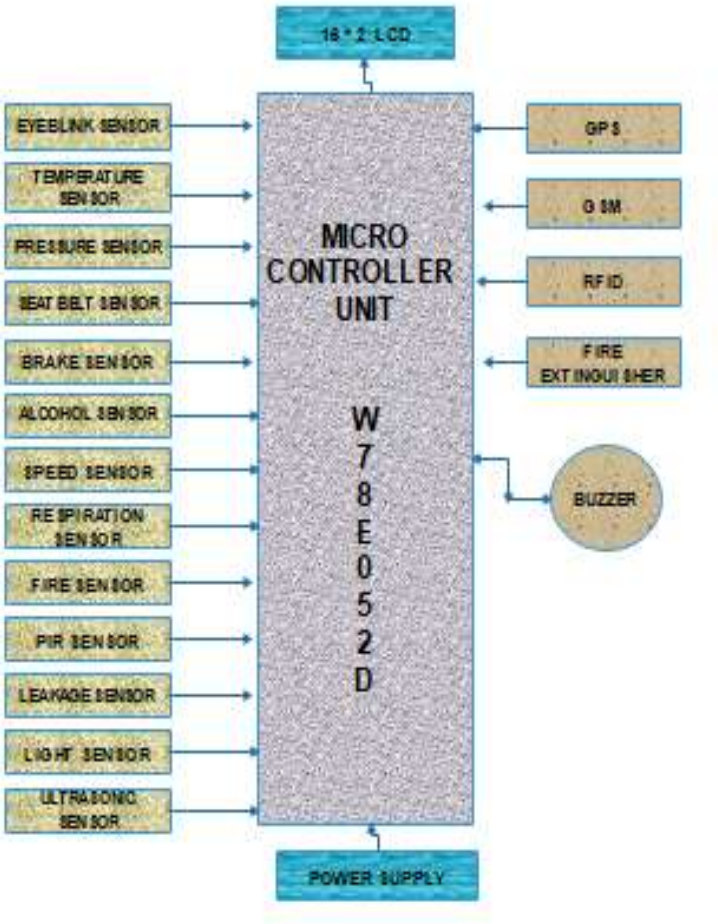

Fig 2.Block diagram of the proposed system

In- Vehicle monitoring system allows the driver to turn on the vehicle if he/she has an valid DL. Once the driver has an valid DL , the system then checks the other parameters such as whether the person is wearing seat belt or not if seat belts are not used then the ignition system doesn't not turn on , and displays to wear the seat belt, through an LCD. The Vehicle turns on only if the warnings are accepted by the driver. Similar procedure is followed for Brake detection.

Several sensors have been used such as eye blink sensor, alcohol sensor, temperature sensor, pressure sensor, leakage sensor, respiration sensor, PIR sensor, light sensor and ultra sonic sensor which would sense the data and display on the LCD.

2.2. HARDWARE RESOURCES

The hardware part consists of several sensors which are integrated in a single platform, which is known as Black box.

2.2.1. Eye blink sensor- Driver drowsiness is termed as an important factor in the vehicle accidents. This sensor involves the measure of eye blink using the IR sensor. The IR transmitter is used to transmit the infrared rays in our eye. The IR receiver is used to receive the reflected infrared rays of eye. If the eye is closed means the output of IR receiver is high else the IR receiver output is low.

Fig.2.2.1.Eye blink sensor.

This helps to know the eye is closing or opening position. This output is give to logic circuit to indicate the buzzer or voice kit. One eye blink sensor is fixed in vehicle where if driver starts drowsing, then it is indicate through alarm .Thus this eye blink sensor helps in controlling accidents due to unconsciousness through Eye blink.

2.2.2. Temperature sensor: Temperature sensor is used to sense the temperature of the engine because due to overheating of the engine might also cause to accidents.

Fig.2.2.2.Temperature sensor

And the particular temperature is also displayed on the LCD, when the temperature is too high, then a fan which is placed near the engine is turned on to cool down the engine.LM35 is the temperature sensor which is used in our proposed system.

2.2.3. Alcohol sensor: Drunken driving is the major reason for road accidents. we have used MQ-3 as alcohol sensor to detect the alcohol content. It is high sensitive to alcohol if it detect more than 0.07mg then the ignition system doesn't turn on. It is a simple drive circuit, stable and long life. If driver has drunk, then alcohol sensor

sends signal to microcontroller. The output of MQ-3 is given to microcontroller and message is displayed

Fig 2.2.3.Alcohol sensor.

2.2.4. Speed sensor: Speed is one of the major parameter which has to be monitored to avoid accidents. An inductive proximity sensor HYP-18RL8P is used to detect the number of wheel turns per unit of time. It has a sensing distance of maximum 8 mm, and a Current Voltage 12 – 24VDC.

2.2.5. PIR sensor: PIR sensors allow us to sense motion, they are used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power.

Fig 2.2.5.PIR sensor

These are also known as, "Passive Infrared", "Pyro electric", or "IR motion" sensors.

2.2.6. Ultra sonic sensor: An Ultrasonic sensor is a device that is used to measure the distance of an Object by using sound waves. This sensor measures distance by sending a sound wave at a specific frequency and listening for that sound wave when returns back.

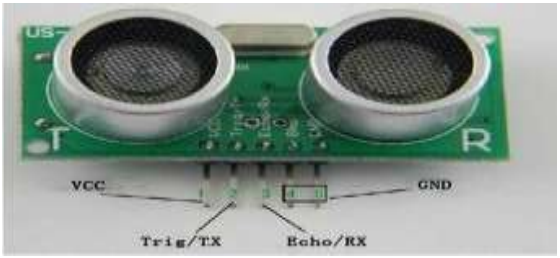

Fig 2.2.6.Ultra sonic sensor.

By recording the travelled time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

2.2.7. Light sensor: A light sensor is an electronic device used to detect light. There are several types of light sensors. A photocell or photo resistor is a small sensor which changes its resistance when light shines on it.

2.2.8. LCD: Liquid Crystal Display screen is an electronic display module. An LCD display is basic module and also commonly used in various devices and circuits. Thus LCD's are preferred over seven segments and other multi segment LEDs.

2.2.9. Power supply: A power supply is an electrical device that supplies electric power to an electrical load. The main function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. Thus power supplies are sometimes referred to as electric power converters.

2.2.10. Buzzer: A buzzer is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. They are used as alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

2.2.11. Seat belt switches: One push button is used to detect the place of the seat belt during the drive. The push button is placed on the seatbelt and gives logic 'zero' when the belt is used and logic '1' when the belt is not placed by the driver. And additionally warning is given in the form of buzzer and displays it in the lcd to wear the seat belt.

2.2.12. Brake switch: The brake sensor switch is a type of switch implemented in the vehicle underneath the brake footstep. This switch controls the brake lights. In order to know if the driver pushed the brake during the accident, this switch is connected to the input of the microcontroller. The brake sensor has an output of 14V. So it needs a voltage divider in order to have 5V at the input of the brake switch pin of the microcontroller.

2.213. Microcontroller unit: A microcontroller is a small computer on a single integrated circuit. In modern terminology, it is similar to, but less sophisticated than, a system on a chip or SoC.

3. METHODOLOGY

Figure below shows the flowchart of the proposed system, as the first step the driver's driving licence is verified through RFID reader. Check various parameters like seat belt, brake, senses the temperature, speed. If all parameters are proper the the ignition will turn on else the vehicle will turn off.

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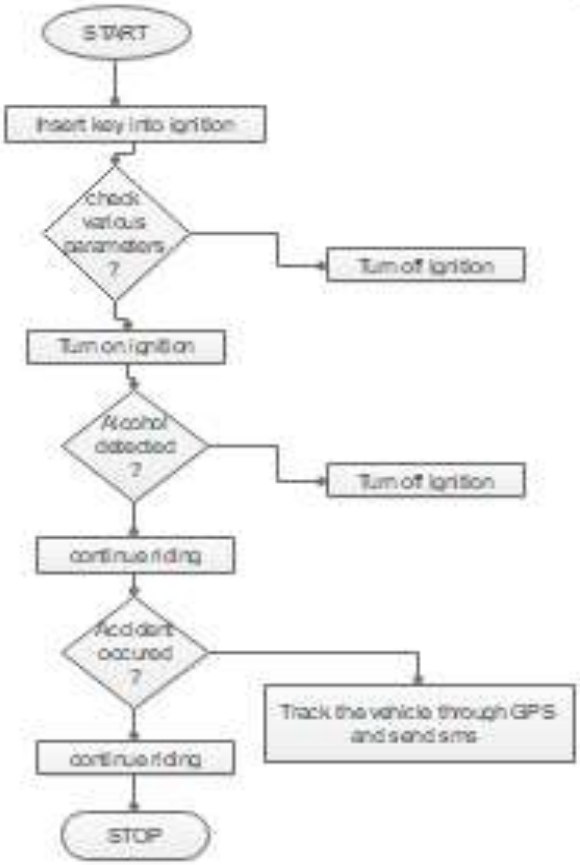


Fig 3.1 .Flow chart

4. ADVANTAGE, DISADVANTAGES AND APPLICATIONS.

4.1. ADVANTAGE

1. The potential time point for risk assessment is minimized and it beneficial for both doctors and patients.
2. Approximately this may reduce 15 to 20% of the death rate due to road accident.
3. We can avoid fire accidents n vehicle.
4. With the help of GPS location, it is possible to find the accident location.
5. With the help of GSM help messages can be sent to care taker and nearby police stations.

4.2.DISADVANTAGES

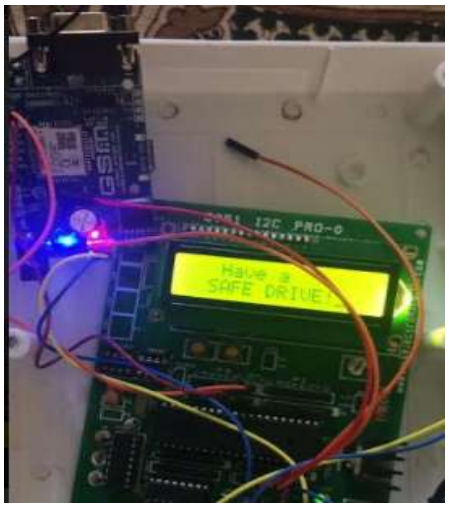
1. Installement cost is high.

4.3.APPLICATIONS

1. The data displayed after the accident can be used for crime investigations and auto mobile manufacturer to improve their auto mobiles which would decrease accidents.
2. Car users and it can be extended for four wheelers also.

5. EXPERIMENTAL RESULT

Below figure shows the experimental results and experimental setup.



6. CONCLUSION

This In-Vehicle monitoring system Application aims to help Accident Investigators and Insurance Companies to perceive the cause of the accident; this should help investigators to speed up their investigation process and provide fast results.

It follows an step by step procedure and checks all the parameter and provides warning, which would help in decreased rate of accidents.

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