ACCIDENT AVOIDANCE AND DETECTION ON HIGHWAYS

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ABSTRACT:

Technological approaches for detecting and monitoring fatigue levels of driver fatigue continue to emerge and many are now in the development, validation testing, or early implementation stages. Previous studies have reviewed available fatigue detection and prediction technologies and methodologies. As the name indicates this project is about advanced technologies in cars for making it more intelligent and interactive for avoiding accidents on roads. By using ARM7 this system becomes more efficient, reliable & effective. There are very less number of systems implemented on human behaviour detection in or with cars. In this paper, we describe a real-time online safety prototype that controls the vehicle speed under driver fatigue. The purpose of such a model is to advance a system to detect fatigue symptoms in drivers and control the speed of vehicle to avoid accidents. The main components of the system consist of number of real time sensors like gas, eye blink, alcohol, fuel, impact sensors and a software interface with GPS and Google Maps APIs for location.

KEYWORDS: GPS Receiver, ARM, Sensors.

1. INTRODUCTION

1.1 An Overview of Existing System:

When you think of work-related safety hazards, you probably think about what goes on inside the workplace. But one of the greatest threats to your safety is not in the workplace, but rather on the road. Someone is injured every 18 seconds. Over 2 million of those injuries turn out to be disabling. A person dies in a crash on U.S. roads every 11 minutes. In fact, motor vehicle accidents are the most common cause of death in the United States- more than cancer or heart attacks. When we think about the serious accident, it could change your life- and not for the better. As of now most of the research and implementation on with mechanical behaviour of the car, its safety and passengers, but what if the driver misbehaviours what can be done?

Each year, car enthusiasts salivate at the prospect of seeing what bleeding-edge designs automakers will unveil on the car show circuit. Those same enthusiasts are often disappointed when the amazing concepts still haven't made it to the auto dealer's showroom floor several years later. But before any new car model can ever go on sale to the public, it must first undergo a battery of testing to make sure it'll be safe, reliable and reasonably in tune with the demands of the motoring public. The government demands some of this testing, while other major components of it are devised by the car companies themselves in an effort to ensure they meet specific standards for performance, fuel economy, comfort and other measures, but those which don't are axed.

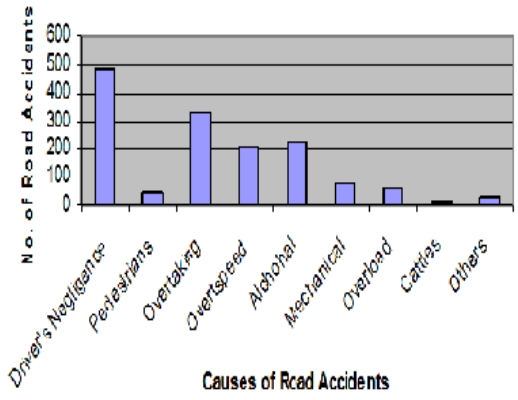

Fig.1.1 Causes of Road Accidents [8]

By observing above chart we are able to conclude that there are three dominant causes of

road accidents- Negligence, Overtaking, Use of alcohols are related to driver. The main reason for driving drunk is that the police are not able to check each and every car and even if they catch any one the police can be easily bribed. So there is a need for an effective system to check drunken drivers.

1.2 Proposed System:

Intelligent systems are in used with every aspect of systems, CARs are the critical systems which are real time and lives are involved. This System not only deals with component monitoring, does even more than that like Passenger activity monitoring, Behaviour analysis, System behaviour, Notification & co-ordinate.

Eye blink Sensor & Alcohol detection are the vital and of great importance from the perspective of passenger safety and traffic safety. Impact detection and notification is also one of the life saving and critical information provider system.

2. VISION-BASED INTELLIGENT VEHICLE RESEARCH WORLDWIDE

Although the first research efforts on developing intelligent vehicles were seen in Japan in the 70's, significant research activities were triggered in Europe in the late 80s and early 90s. MITI, Nissan and Fujitsu pioneered the research in this area by joining forces in the project "Personal Vehicle System" [3]. In 1996, the *Advanced Cruise-Assist Highway System Research Association* (AHSRA) was established among automobile industries and a large number of research centers [2]. In the US, great deals of initiatives have been launched to address this problem. In 1995, the US government established the *National Automated Highway System Consortium* (NAHSC) [4], and launched the *Intelligent Vehicle Initiative* (IVI) in 1997. Several promising prototype vehicles/systems have been investigated and demonstrated within the last 15 years [5].

3. THE EXISTING ADVANCE SYSTEM FOUND IN HIGH END CARS

3.1 ABS (Anti-Locking Braking System):

ABS works with your regular braking system by automatically pumping them. In vehicles not equipped with ABS, the driver has to manually pump the brakes to prevent wheel lockup. In vehicles equipped with ABS, your foot should remain firmly planted on the brake pedal, while ABS pumps the brakes for you so you can concentrate on steering to safety.

3.2 EBD (Electronic brake-force distribution):

Electronic brake-force distribution (EBD or EBFD), Electronic brake-force limitation (EBL) is an automobile brake technology that automatically varies the amount of force applied to each of a vehicle's brakes, based on road conditions, speed, loading, etc. always coupled with anti-lock braking systems.

3.3 SRS Air Bags (Supplemental Restraint System Air Bags):

An airbag is a vehicle safety device. It is an occupant restraint consisting of a flexible envelope designed to inflate rapidly during an automobile collision, to prevent occupants from striking interior objects such as the steering wheel or a window, the sensors may deploy one or more airbags in an impact zone at variable rates based on the type and severity of impact; the airbag is designed to only inflate in moderate to severe frontal crashes.

3.4 Immobilizer:

An immobilizer is an electronic device fitted to an automobile which prevents the engine from running unless the correct key (or other token) is present. This prevents the car from being "hot wired" after entry has been achieved.

3.5 Parking Sensors:

Parking sensors are proximity sensors for road vehicles which can alert the driver to unseen obstacles during parking man oeuvres. Parking

sensors generally fall into two categories. i) Electromagnetic parking sensors

ii) Ultrasonic parking sensors.

3.6 Cruise Control:

Cruise control (sometimes known as speed control or auto cruise) is a system that automatically controls the speed of a motor vehicle. The system takes over the throttle of the car to maintain a steady speed as set by the driver.

3.7 Existing System And Its Drawback:

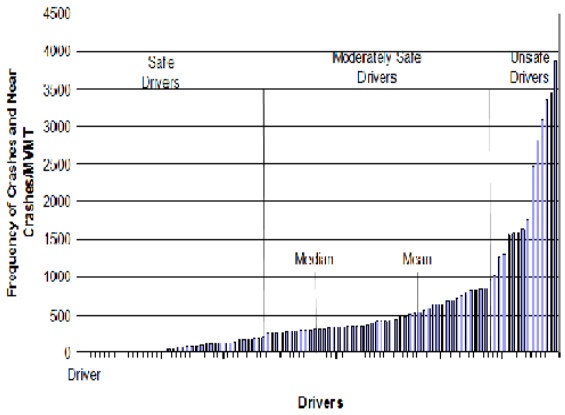

Fig.3.1 100 Car Study Results [8]

After doing the observation of number of accidents we cleared that frequency of crashes is because of unsafe drivers. Driving under the influence of alcohol or drugs, which is responsible for about one-third of all road accidents. Every year people are injured or killed on the road because another driver was driving under the influence. Defensive drivers never drink nor take drugs and drive. They understand that alcohol and drugs impair your- Ability to determine distances, Reaction time, Judgment and vision.

None of this above detects Driver or Passenger misbehaviour.

4. POTENTIAL FUTURE SYSTEM

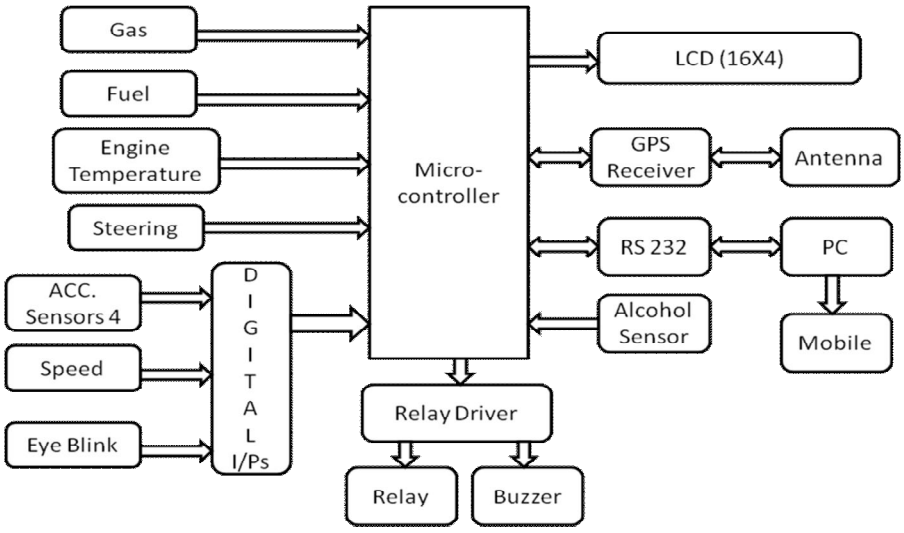

Fig. 4.1: - Proposed System Block Diagram (CAR Unit).

4.1 Hardware Description

The heart of system is MICROCONTROLLER which will access the data. In our project we will use 'ARM' controller.

To measure temperature of car there will be a temperature sensor. To convert the output of sensor into electrical form we will use signal conditioning (transducer). As controller operates only on digital data, so this analog data is to be converted into digital form by using ADC. But ADC is inbuilt in ARM processor. So the output of the signal conditioner circuit is directly connected to ARM processor. Similarly LPG gas sensor is

connected to ARM using signal conditioner circuit. The temperature meter indicates the temperature of engine body. It also indicates the overheating of the vehicle by announcing frequent beeps.

For distance & speed measurement purpose we are going to use RPM counter. Nowadays the vehicles have a mechanical speedometer. The speedometers we have made use the digital technique. This displays the speed of vehicle in km/hr. The disc rotates through the optical assembly having infrared LED and phototransistor. The total assembly gives the digital pulses from which we can derive the RPM and speed of the vehicle.

The LPG gas leakage detector is used to detect the gas leakage and indicate it with the help of buzzer to driver that there is gas leakage. If the driver is found to have alcohol in the breath, it warns and then turns the ignition off and hence possibility of accident is avoided. Also we have designed an eye blink sensor which continuously monitors the number of times the eye blinks, if the eye blinks count decreases that means the driver is sleepy, in that case a buzzer is operated.

If accident happened by using impact sensors we are able to found out on which side the impact occurred. After collecting all information which is stored in internal memory, µC send this data to base or surveillance unit via SMS using GSM modem.

All this data will store in EEPROM & display on LCD also on computer whenever the accident switches are pressed which are placed on the wall of car.

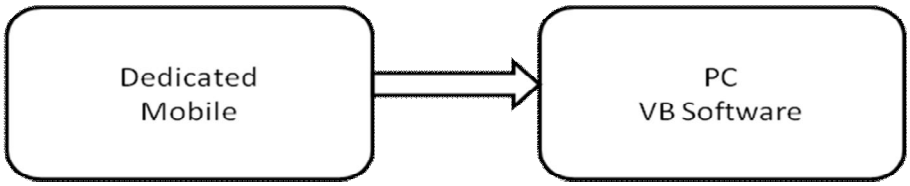

Fig. 4.2: - Block Diagram of Base Unit.

4.2 Software Overview

The software selection is the backbone of the entire project. Software development includes programs written for the interfacing of the Microcontroller with LCD display, keyboard, ADC, Auto-dialing circuit and the mobile interface. The codes written for the Microcontroller are best explained with the help of the flow charts included in this chapter.

1. Having had a look at the software and hardware fundamentals of the system, the next step is to understand the software programming incorporated in the microcontroller to achieve the given task. While performing its calculations and control, the microcontroller need to be human friendly both in terms of data input and display.

2. The software has been written in structured manner in which all the subroutines are linked to a single main program. Each subroutine is further divided into sub-sub routine as per the requirement.

When complete PCB with assembling is finished it comes to software where both assembly and c language is used. Arm controller is programmed for performing various operations. Whole coding is divided into different modules. The main code consists of initialization of all ports. Then in sub modules LCD initialization, ADC initialization, writing into the memory and reading the memory is done.

5. IMPLEMENTATION

5.1 MQ-3 gas sensor: MQ-3 gas sensor has high sensitivity to Alcohol, and has good resistance to disturb of gasoline, smoke and vapour. The sensor could be used to detect alcohol with different concentration; it is with low cost and suitable for different application. Also it has Long life and low cost and simple drive circuit.

5.1.1Application

* Vehicle alcohol detector

* Portable alcohol detector

5.2 MQ-6 gas sensor: MQ-6 gas sensor has high sensitivity to Propane, Butane and LPG, also response to Natural gas. The sensor could be used to detect different combustible gas, especially Methane; it is with low cost and suitable for different application.

5.2.1Application

* Domestic gas leakage detector

* Industrial Combustible gas detector

* Portable gas detector

5.3 GPS Receiver: The GPS smart receiver features the 16 channels, Ultra low power GPS architecture. This complete enabled GPS receiver provides high position, velocity and time accuracy performances as well as high sensitivity and tracking capabilities. Thanks to the ultra low power CMOS technology, the GPS receiver is ideal for many portable applications such as PDA, Tablet PC, smart phone etc.

5.3.1 Applications:

*****Automotive

*Personal/Portable Navigation (PDA)

*Geographic Surveying

*Sports and Recreation

5.3.2 Benefits to User

*****Ultra low power consumption

*Easy and fast to install

*Superior urban canyon performance

*Low cost with high performance

6. RESULT

We continuously scan for various parameters of car, such as fuel, engine temperature, speed, steering position, eye blink and alcohol sensors, as soon as impact id detected more impact related sensors comes in pictures. The µC stores all this data in the internal memory.

If the driver is found to have alcohol in the breath, it warns and then turns the ignition off (if µC is set with threshold values is set. Also applicable to other sensors too) and hence possibility of accident is avoided. Also we have designed an eye blink sensor which continuously monitors the number of times the eye blinks, if the eye blinks count decreases that means the driver is sleepy, in that case a buzzer is operated.

If accident happened by using impact sensors we are able to found out on which side the impact occurred. After collecting all information which is stored in internal memory, µC send this data to base or surveillance unit via SMS using GSM modem.

On the base side we receive the data such as engine temperature, fuel, speed, eye blink status, alcohol level, impact etc. and also the GPS co-ordinates on the online Google maps. The PC unit has the online VB software which graphically shows all the data to the analyst so that the reasons of crash or accident can be understood better.

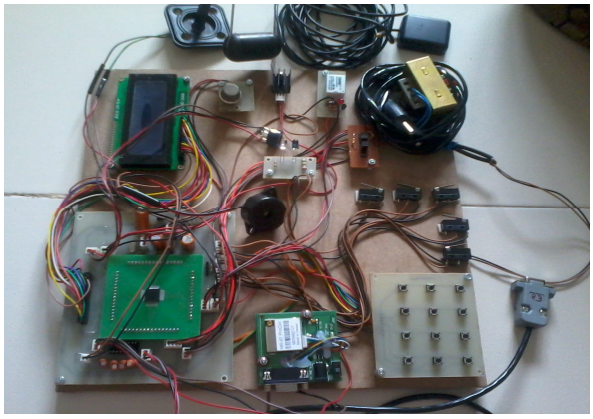

Fig. 6.1: The System Devoloped

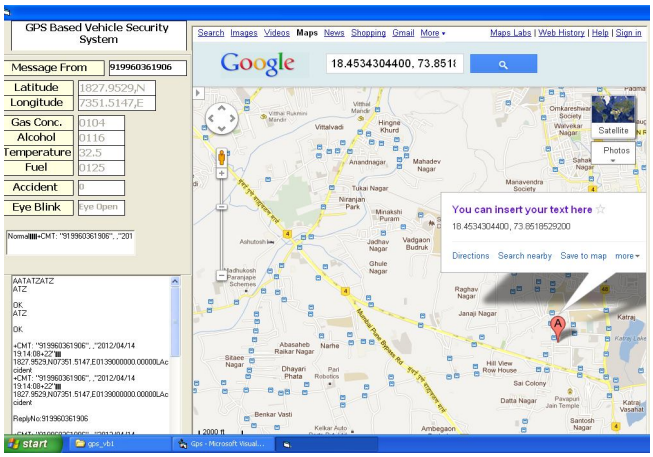

Fig. 6.2: Google Map API for Vehicle Notification

CONCLUSION

It is due to the driver's fatigue, traffic accidents keep with a yearly increasing of a high rate. This paper shows the new fatigue detection algorithms & techniques using eye blink, alcohol, impact, gas, etc. sensors. In this technique the fatigue will be detected immediately and regular traps the events driver and third party. Through research presented in this paper, we propose an intelligent car system for accident prevention and making the world a much better and safe place to live.

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