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Proof collection from car black box using smart phone for accident detection

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ABSTRACT
According to the WHO, more than a million people in the world die each year because of vehicle accidents. In order to react to this situation, the black box concept is used as first step to solve the problem[1]. In order to overcome from this problem, in this paper we are trying to implement the concept of "black box" in the car. Car black box is a device used to record the information's such as engine temperature, presence of obstacle, alcohol content and exact location of the accident about the vehicle. Along with this we are using smartphone to get the snap shots which are related to accidents and finally send this information along with the snaps to police sever.
Keywords – Black box, GSM, P89V51RD2 microcontroller, Smartphone, Accident

I. INTRODUCTION

According to the World Health Organization, more than a millions of people in the world die each year because of transportation-related accidents [1].In order to solve these problem black box concept was introduced, which records the engine temperature, front & back obstacle conditions. Like flight data recorders in aircraft, "black box" technology now plays a very important role in the motor vehicle crash investigation.[4]A significant no of vehicles currently on the roads contains the smartphone, car black box & GPS, which records the information in the event of a crash. That is why it is so important to have the black box in the car which records the information before, during &after a crash. This system mainly consists of 2 section. In first section it collects & detects all the information contained in the black box[4]. In second section by using smartphone it takes the critical snapshots related to accidents & send this snaps to the police server in a simplified way. In order to implement the first section many components & the various types of sensors are used. While the second section was implementing by using the embedded C programming. Embedded C programming not only helps in recording the data but also helps in retrieving the data from Micro Controller memory to an LCD which is used to display the output. Each smart phone is installed with special software which we developed. Besides, in order to communicate with police station server, a driver needs to have a user ID & Password which are already present in smart phone. Car black box is a digital electronic device which records the information about the Engine temperature, GPS location identifier, slot sensor, front & back obstacle & motor mobility. GPS & GSM works together in ensuring vehicle safety. It is programmed in such a way that whenever the collision occurs the location of vehicle is sent to registered telephone number through GSM & all the sent details can be used to locate the vehicle using google map.

II. SYSTEM DESCRIPTION

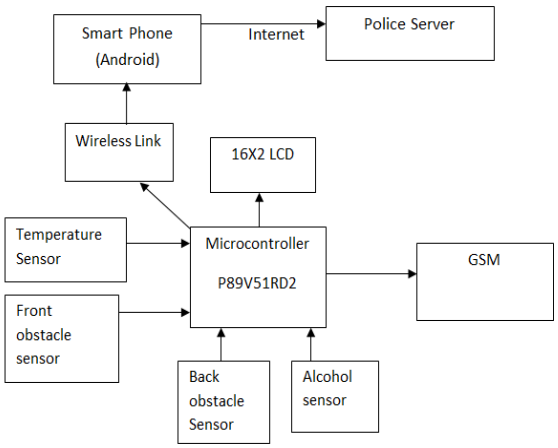

Fig 1: Black diagram of car black box

Block diagram in our proposed system is shown in Fig1. Black box contains the alcohol sensor, temperature sensor, front and back IR sensors, GSM & 16x2 LCD [7]. It detects the engine temperature, location (GPS), obstacle presences & alcoholic content. The outputs of these parameters are displayed on the LCD. The system developed also

has the facility of taking snap shots during the accident using smartphone which could be vital for post-crash analysis. This collected information's along with the snaps are send to the police server through the internet. GPS tracking system developed in this paper helps to track the vehicle in case of accident and enables authorities to extend immediate emergency medical service [2,3,9].

III. HARDWARE DESCRIPTION AND DESIGN

A. P89V51RD2 Microcontroller

The system uses 8051 based Philips P89V51RD2 microcontroller as a master controller [5].

FEATURES

- 80C51 CPU with 5V operating voltage from 0 to 40 MHz
- 64 kB of on-chip flash user code memory with ISP and IAP.
- SPI and enhanced UART.
- Four 8-bit I/O ports with three high-current port 1 pin.
- Three 16-bit timers/counters.
- Programmable watchdog timer.
- Eight interrupt sources with four priority levels.
- Second DPTR register
- Low power modes

B. Temperature Sensor

Engine temperature is the important parameter in control unit, if this value goes to abnormal, some unwanted gases exhaust from vehicles due to improper combustion. In this paper, to obtain the vehicle engine temperature, we used LM35 as temperature sensor. It continuously senses the engine temperature and fed to the microcontroller. It converts temperature value into electrical signals. It is rated to operate over a -55 to +150°C temperature range [1].

C. Alcohol Sensor

In this paper, we use MQ-3 as alcohol sensor to detect the alcohol content. It is high sensitive to alcohol, 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 on LCD[1].

D. GSM Module

GSM used in ensuring vehicle safety. It is programmed in such a way that whenever the collision occurs the location of vehicle is sent to registered telephone number through GSM & all the sent details can be used to locate the vehicle using Google map[8].

E. LCD Display

A liquid crystal display (LCD) is a flat panel display, electronic visual display, based on Liquid Crystal Technology. It is a thin, flat display device made up of any number of colour or monochrome pixels arrayed in front of a light source or reflector. In this paper we are using 16×2 LCD [7]. It receives the

collected information's which are stored in the microcontroller and displays these messages. It uses very small amounts of electric power.

F. Slot Sensor

This sensor is used to give the information about whether the seat belt is weared or not. This is a Optoelectronic device. It can act as a opt isolator. The IR diode in the left portion keeps emitting IR rays. The opt transistor keeps sensing these rays. The Centre portion is a slot into which a thin obstacle can pass for ex., a RFID card. Once an obstacle is detected the input to optical transistor is blocked.

G. IR Sensor

IR sensor is used to detect the obstacle on the vehicle travelling path. If any obstacle detected in the vehicle travelling path a warning message will be displayed on the LCD. For example If obstacle detected on front side of the vehicle message will be displayed on the LCD as "FRONT SIDE OBJECT FOUND" or "FRONT=1"

H. Power Supply

As per this paper design, a 5V regulated power supply is required. All the modules are selected to work with 5V supply. LM317 adjustable regulator is used generate 5V regulated power supply. A 12V, 2A SMPS AC-DC adaptor is used as an external power supply. To operate the paper the male socket to the adaptor is connected to the DC jack present on the microcontroller board. Our microcontroller power supply section is so generalized, we can use step-down transformer or DC adaptor to power ON the board.

IV. Functional description

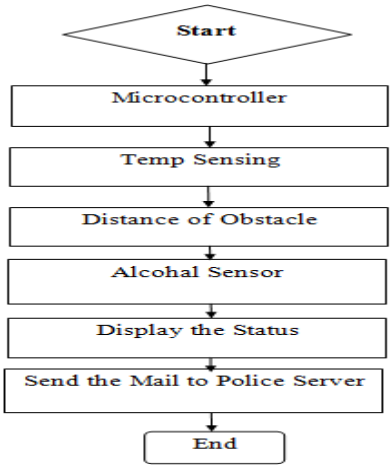

Fig 2: Functional description of proposed system

When accident occurs the microcontroller gets activated and starts collecting the information such as temperature, presence of obstacle, alcohol content respectively from the sensors. This collected information is displayed and is sent to the police server through mail. By using this information police can easily know the accident spot and they get the correct proofs for the accident to provide justice.

V. Experimental Results

The paper has both software and hardware implementation. The intermediate results for both are explained in this paper. As the project aims at design and development of "Car black box using smart phone", the results are shown accordingly.

Whenever the power is switched on, a display appears as "WELCOME" and "GSM INITIALIZED. And the vehicle starts moving.

Fig 3: System shows the start of vehicle

If vehicle meet with an accident a message will be displayed on LCD as "accident occurred"

Fig 4: system showing accident occurred and vehicle stopped

The other parameters such as temperature, alcohol, seat belt are continuously sensed by respective sensors and are displayed on the LCD as "T= , SEAT= , RR= , FR= , GS= "

Fig 5: System showing the various parameters

In case of collision occurred a message is received by registered number from the GSM

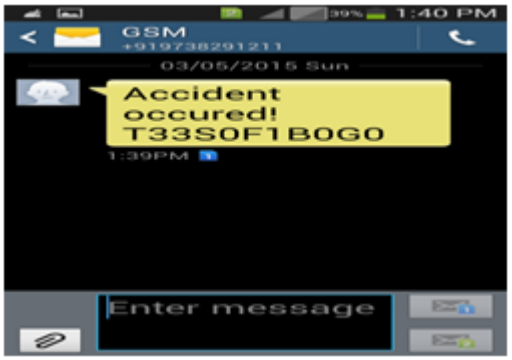

Fig 6: The messages received from GSM

The complete system of vehicle black box is as shown in the fig 7

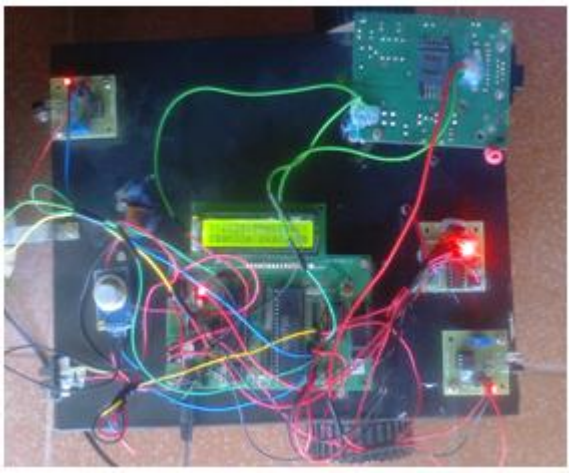

Fig 7: model of the black box

VI. Conclusion

This paper attempted to equip automobiles with "Black Box' kind of equipment which aids driver for safe driving, ensures vehicle safety, help in locating vehicle in case of accidents and useful information for post-crash analysis. This paper used different sensors like temperature sensor, alcohol sensor, slot sensor and IR sensor to ensure safety of the vehicle. The obstacle detection mechanism enables and guides the driver for safe driving. The data collected

using the above sensors are also useful in the post-accident analysis. The system developed also has video recording using webcam which could be vital for post-crash analysis. GPS tracking system developed in this paper helps to track the vehicle in case of accident and enables authorities to extend immediate emergency medical service. Measuring tyre pressure, Speed of the vehicle, Improved break failure condition using multiple sensor, Sleep alarm indicator, Video processing for panic and accelerity. Options can be provided as a part of future enhancements.

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