WIRELESS VEHICLE BLACK BOX SYSTEM FOR ACCIDENT PREVENTION AND DETECTION

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Abstract—Traffic accidents are one of the leading causes of fatalities. With the increasing number of vehicles on road now a days that also cause a steep rise in the number of road accidents with plenty of individuals losing their lives .This rate is high on the national route and there's nobody to assist an accident victim. Insurance settlement is additionally major drawback for insurance firm furthermore as accident victim. This paper focuses on wireless information recorder or black box using MEMS (Micro Electro mechanical sensor) accelerometer and GPS(Global positioning system) system for vehicle observance and to make safer vehicles and to enhance road status. MEMS is a highly sensitive device that detects any forward ,reverse ,left and right movement .This system contains GPS and GSM module beside ARM7 unit incorporating a device circuit which has measuring system, smoke detector, alcohol detector, temperature detector and pressure detector. once accident occur, these various sensors connected to the system will activate and provides respective output. The system can send message to the authorised persons within the contact list. The received data will be in the form of longitude, latitude, time and date. a similar data will be keep in flash card just in case of any communication failure. The social motto behind developing this paper is to provide immediate response as well as rescue of vehicle accident victim for saving properties and most significant lives.

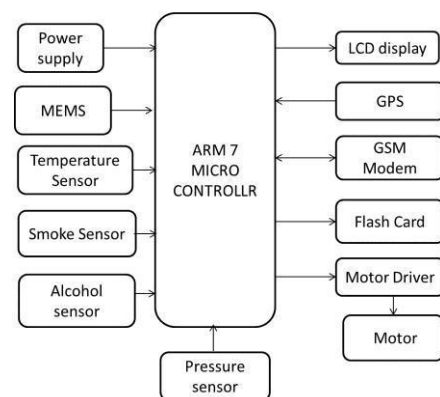Keywords- Accelerometer, GSM module, GPS module.

I. INTRODUCTION

According to survey, the demand for vehicles are increasing so the heavy traffic on the road is major issue. Safety in travelling is primary concern for each individual. Consider the situation that a vehicle is met with an accident in the middle of journey and there's nobody to assist. If any injury happened there'll be loss of life. As in the investigation the eye witness plays an vital role therefore there'll be no systematic examination. In order to overcome this drawback black box system draws the primary step to unravel it. The system can be developed with minimum number of circuits that improves

vehicle design, treatment for crash victims & assisting insurance firms with their vehicle crash investigation. This system keep watch on what happen in vehicle before, during and after the accident. We cannot accurately find what exactly happens within the vehicle. Now a days we all like a digital system which is able to tell us the problem in the way which we understand and so can find and solve the matter. The black box is made from robust material which is capable to sustain intense impact and pressure damaged. the material used are like hardened steel or titanium. The system principally classified in three elements. First, detection and collection of data. Second, to save data safely in Flash card. Third and most significant, presentation of data in user friendly approach. C-programming is being employed to interface all the sensors to the ARM-7 controller because it offers great efficiency. This helps us to record data and also recover it from system memory to display it on LCD.

II.METHODOLOGY

BLOCK DIAGRAM

The process of working of this project is explained as follows. the entire equipment of this project is placed inside a vehicle isn't visible to others. Here we have MEMS accelerometer which can sense the movements of the vehicle continuously. When an accident occurs to the vehicle the movement of the vehicle while the incident is happening will be detected by the MEMS and this data is given to microcontroller. Here we use GPS module to track the location of the vehicle where the

accident has occurred. GPS will get the graphical location of the vehicle and these location values are displayed on the LCD (Liquid Crystal Display) as well as stored in flash card. The location values are given to microcontroller. Controller provides this data to GSM module. By using GSM we can send the message. in this project we have temperature detector, pressure detector, alcohol detector, smoke detector that are interfaced to the ARM-7 microcontroller.

III.   PROPOSED HARDWARE

ARM7 stands for Advanced reduced instruction set computing Machine. it is a general purpose 32 bit microprocessor which offers high performance and also the cores were released from 1993 to 2007. The ARM7TDM and ARM7TDMI-s were the most standard cores of ARM7 family. Thumb 16 bit instruction set provides improved code density compared to previous design. LPC2148 32 bit ARM7 TDMI supporting real time simulation. LPC2148 has a pair of UART ports and it contains two switches one is used for temporary flipped +3.3V power supply is required to LPC2148. All these design uses a von Neumann design. The main characteristics of ARM7 is its low electric power consumption. RISC (Reduce instruction set computing) based computer style approach means that ARM processors require considerably fewer transistor than typical processor. This approach reduces costs, heat, and power used. LPC2148 is widely used IC from ARM7 family.

1.   *MEMS (Micro-Electro-Mechanical-Sensor)*

MEMS is a technology that in its most general form will be defined as miniaturized mechanical and electromechanical elements. The important physical dimensions of MEMS devices will vary from well below one micrometer on the lower finish of the dimensional spectrum. The one main criterion of MEMS is that there are at least some components having some sort of mechanical functionality whether or not these components can move. The term used to define MEMS varies in different components of the world while in some other components of the world they are known as

―Microsystems Technology‖ or ―micro machined devices‖. In the case of micro sensors, the device usually converts a measured mechanical signal into an electrical signal. Sensors gather information from the surroundings through measuring mechanical, thermal, biological, chemical, optical, and magnetic phenomena. The electronics then process the data.

1.   PRESSURE DETECTOR

A pressure detector is a device equipped with a pressure-sensitive element that measures the pressure of a gas or a liquid against a diaphragm made of stainless steel, silicon, etc., and converts the measured value into an electrical signal as an output.

2.   SMOKE DETECTOR

A smoke detector is a device that senses smoke, typically as an indicator of fire. Commercial security devices issue a signal to a fire alarm control panel as part of a fire alarm system, while household smoke detectors, also known as smoke alarms, generally issue a local audible or visual alarm from the detector itself.

2.   ALCOHOL DETECTOR

This alcohol detector is suitable for detecting alcohol concentration on your breath, just like your common breathalyzer. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration. The drive circuit is very simple, all it needs is one resistor. A simple interface could be a 0-3.3V ADC.

3.   TEMPERATURE DETECTOR

A temperature detector is a device that measures a physical quantity and converts it into a 'signal' which can be read by an observer or by an instrument. For example, a mercury thermometer converts the measured temperature into the expansion and contraction of a liquid which can be read on a calibrated glass tube.

3.   GPS(GLOBAL POSITIONING SYSTEM)

The Global Positioning System is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use.

4.   GSM MODEM

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. GSM is a cellular network, which means that cell phones connect to it by searching for cells in the immediate vicinity. There are five different cell sizes in a GSM network—macro, micro, pico, femto, and umbrella cells. The

coverage area of each cell varies according to the implementation environment.

5. LIQUID CRYSTAL DISPLAY (LCD):

A liquid crystal display (LCD) is   a flat-panel display other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome.

IV. PROPOSED SOFTWARE

1. EMBEDDED C:

An embedded system is the one which is designed to perform a specific task and the embedded software rules the entire system. This software for a particular embedded system could be developed using various embedded programming languages. But embedded C is the well known embedded programming language. It is small and reasonably simpler to learn, understand, debug and program.

•Unlike assembly, C has advantage of processor-independence and is not specific to any particular microprocessor/ microcontroller or any system. This makes it convenient for a user to develop programs that can run on most of the systems.

• As C combines functionality of assembly language and features of high level languages, C is treated as a ―middle level computer language" or ―high level assembly language‖.

• It supports access to I/O and provides ease of management of large embedded projects.

2. KEIL SOFTWARE

After developing the software, it must be downloaded to the microcontroller through any one of the downloading tools such as universal programmer. Hence the program should be cross compiled before downloading it into the microcontroller; the keil compiler comes into act at this place. Keil Software provides us with software development tools for the ARM microcontrollers. With these tools, we can generate embedded applications. The keil tool kit includes three main tools, assembler, compiler and linker.

• An assembler is used to assemble the ARM assembly program

• A compiler is used to compile the C source code into an object file

• A linker is used to create an absolute object module suitable for the in-circuit emulator.

V. CONCLUSION

The system wireless black box using MEMS accelerometer and GPS tracking has been developed for vehicle accidental monitoring .The proposed work is the prototype that has delivered very reliable results of accident identification, location and physiological parameters monitoring and transmission. so this work can reduce the accident death ratio in considerable amount even in rural roads and to protect not only the passengers inside the vehicle but also the persons around it and to prevent collision of any vehicles with another vehicle. The proposed system is greatly helpful to avoid accidents that happen during the night time. The black box system built can be implemented in any vehicle. As soon as the driver runs the motor, this system will begin saving the events of the corresponding vehicle. the data saved can be retrieved only when the accident for privacy functions. using serial transmission the EEPROM and display it to the user. additionally, a detailed report will be given to the user containing the recorded data within the memory. when the accident is occurred then every details of sensors is calculated and stored in the memory. These values are useful to know how the accident is occurred. The message is displayed in the phone when the accident is occurred to the vehicle. this is sent to the emergency numbers by the GSM module which is mounted in the vehicle. Sensors work accordingly and gives the respective output.

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