Intelligent Accident Identification System using GSM and GPS Modem

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***Abstract*— Due to population explosion the usage of vehicles has doubled and so have the accidents. No one can prevent the accident, but can save their life by expediting the ambulance to the hospital in time. A new vivid scheme called Intelligent Accident prevention is introduced. The objective of this scheme is to minimize the time taken to identify the location of the accident and also minimize the time taken to provide with emergency services. So that the ambulance can reach the spot in time and human life can be saved and the accident location is identified sends the accident location immediately to the main server which then co-ordinates with the nearest hospital so as to provide the quickest emergency ambulance resources. Other than this project aims to identify the cause of accident and immediately halt the vehicle if a certain predetermined value has reached in the cause. The module while stopping the car relays the co-ordinates to the relatives of the person to make them aware about the situation.**

Key words: GPS (Global Positioning System), GSM (Global Service for Mobile Applications), Vibration sensor accelerometers (piezoelectric), SMS (Short Message Service),Microcontroller, Alcohol Sensor.

I. INTRODUCTION

This is the GPS based vehicle accident detection and security system. A GPS receiver receives the satellite signal which contains the location (latitude and longitude) and transmits this data to the microcontroller. All other functions are provided by the Microcontroller (MCU). MCU not only reads the information of the location but also displays it on the LCD matrix. . In the vehicle, has different sensor's like, Fire Detection, CNG gas Leakage, Smoke detector or vibration sensor placed at appropriate locations.

When any sensor detected in vehicle, MCU send location and sensor status VIA SMS to user.

PIC microcontroller is used for interfacing to various hardware peripherals. The design of the project involves hardware embedded system which monitors the condition of the vehicle with respect to the sensors and relays the location continuously.In order to achieve this a PIC16Fxxx microcontroller is interfaced serially to a GSM Modem and GPS Receiver. The location of the vehicle from a remote place is sent via a GPS modem. Out of the various parameters given by the GSM modem only the NMEA data coming out is read and transmitted so that it can be displayed on to the LCD. The same data is sent to the mobile at the other end from where the position of the vehicle is demanded. An MCU Internal EEPROM is used to store the mobile number.

II. THE HARDWARE SYSTEM

LCD: The liquid crystal display controller and driver LSI displays various types of alphanumeric, characters, and symbols. It can also be configured to drive a dot-matrix liquid crystal display with the help of the microcontroller. All the functions such as display character and liquid crystal driver, required for driving a dot-matrix liquid crystal display are provided internally on one chip.

Global System for Mobile Communication: GSM technology is used for communication in most othe recent mobile phones In the project we use RS232 module for serial communication.It utilises SIMCOM Make SIM900 Quad-band. The various frequencies on which the GSM modem works are 850 MHz, 900 MHz, 1800 MHz and 1900 MHz.. The GSM modem can be directly connected to the PC serial port because it has an internally built RS232 circuitry.

GSM modem also has an internally available TCP/IP stack which can be used to provide internet connection to the modem which can be used for data SMS transfers. Other than standard AT commands it also supports an extended AT command like monitoring the battery status of the mobile, reading and editing messages etc. Other advantages are small size and easiness to use as plug in GSM Modem.

Global Positioning System: It (GPS Global Positioning) is a navigational system that uses a network of 24-32 satellites to. determine the exact location of any object from the earth. through the satellites are positioned in orbits about an altitude of 12,000 miles from the earth surface. the satellites use microwave frequency for communication which is picked up by the GPS sensors.

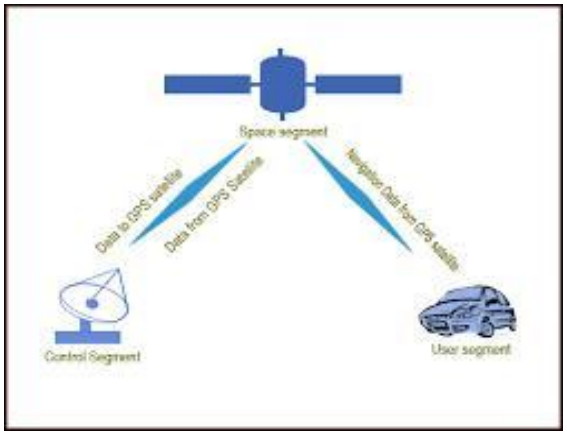

Fig 1. Global Positioning System

Sensors: A maximum of 4 sensors can be connected to the system, these can be found in the circuit diagram. The sensors should have their contacts open during the inactive state (i.e. normally open) or active low signal @ 5V DC. DC power supply of 5V is applied to all the sensors at corresponding wiring terminals (CN2). There are many type of sensor available you can connect with the projects.

Buzzer: A buzzer(12V) is connected to the microcontroller at port RD.6 through a driver transistor. The buzzer requires a 12V at a current of 100milli amperes which is not provided by the MCU.

So the driver transistor is added. The relay is used to audible alarm indication. Normally the buzzer remains off. As soon as pin of the micro controller goes high, the buzzer operates.

Microcontroller: It is the CPU of our project. A PIC microcontroller will be used. The various functions of microcontroller are like receiving and transmitting data to GSM, storing the mobile number, interface the sensors with the relay, Displaying data via LCD matrix.

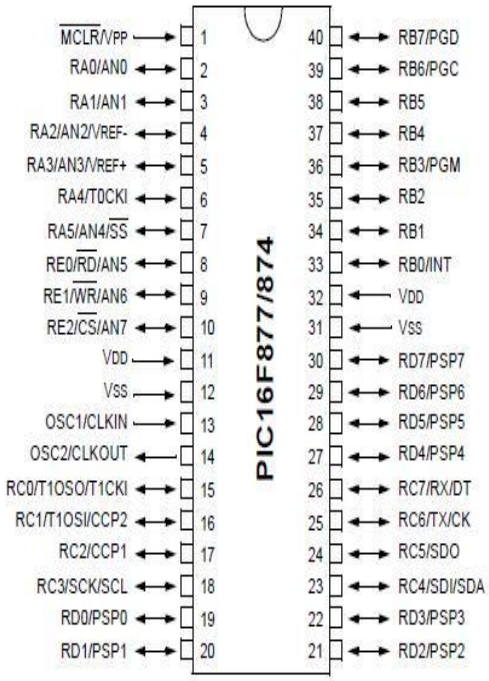

Fig 2. PIC Microcontroller

III. WORKING PRINCIPLE

The power to the module is turned on with the help of a switch. The power supply consists of 12V and 5V DC supply which can be provided externally.The PIC microcontroller functions on a 5V DC supply and the Buzzer and Relay circuitry are driven on a 12V DC supply.The GPS module is interfaced with the microcontroller and used to obtain the location of the vehicle via satellite communication. The GSM module is used to communicate with the mobile number owner stored in the EEPROM through text message. The sensors (Active LOW) used in the working of this project are piezoelectric vibration sensor, Alcohol detector, Drowsiness detector and speed sensor.The threshold limits for the values attained by these sensors after which they are activated can be predefined in the microcontroller.In case any of the sensor is activated, it triggers the different modules interfaced with the microcontroller and the Buzzer alarm is activated.The LCD screen (16x2 display) is interfaced and notifies the driver about the activated sensor in the form of texts preloaded in the LCD through programming.The GSM module sends a text message to the stored number including the location of the driver.A relay device connected to the LCD via relay driver is used so as to turn off the vehicle by cutting electric power supply to the

engine.The module can be programmed such that it gives out a set number of warnings before the modules are activated.

IV. FLOW CHART

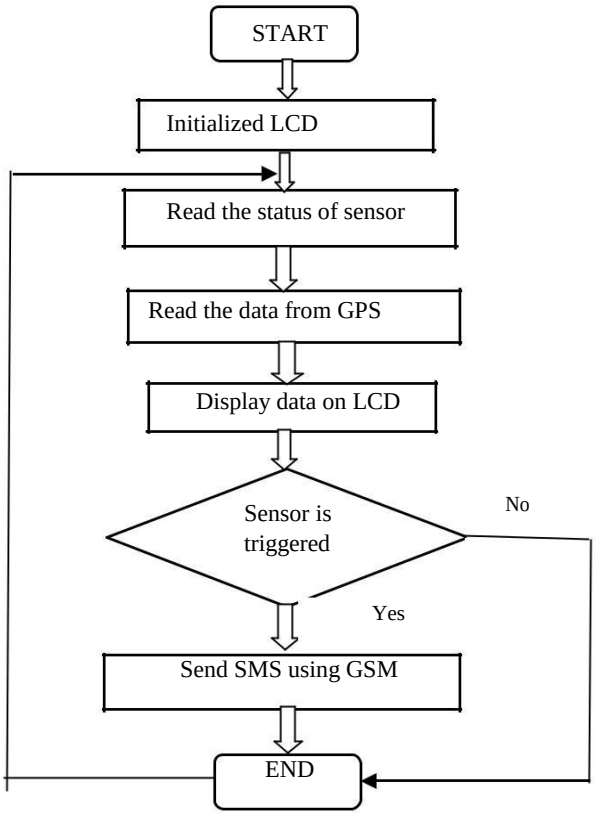

Fig 3 Operational Flowchart

V. DESIGN OF PROPOSED HARDWARE SYSTEM

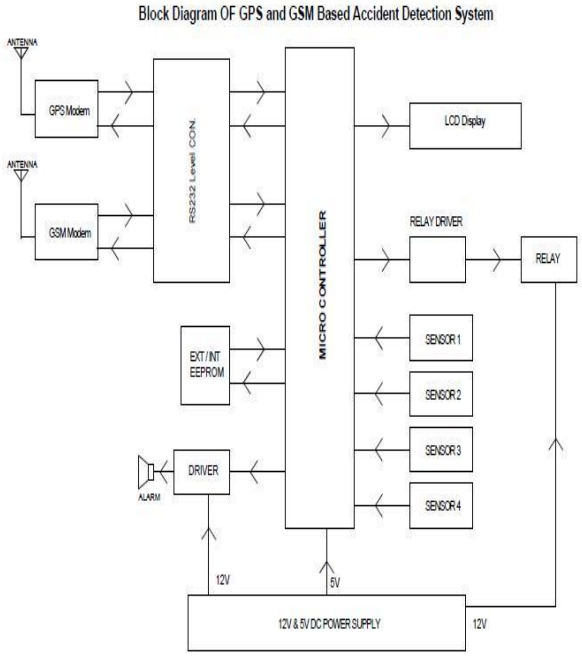

Fig 4. Block Description

Power supply Stage:

It's based on 3 terminal voltage regulators, which give the desired regulated +5V and unregulated +12V. Initially the power is delivered from standard AC/DC adapter(12V) or 12V_500ma Transformer. This power is fed to bridge rectifier (D3, 4, 5, 7) the output of which is then filtered using 1000uf electrolytic capacitor and fed to U5 (voltage regulator). U5 +5V output powers the micro controller and other logic circuitry.The unregulated voltage of approximately 12V is required for GPS and GSM Modem and relay, buzzer driving circuit.

Interface stage: LCD Interface

A single HD44780U can display up to two 8-character lines (16 x 2).A LCD module, display the information. The MCU sends control signal through 8 and 9 (RE0 and RE1) and the data signals through Pin 11 through 18 (RC0 – RC3) of the micro controller. Pin no 3 of the LCD is used to control the contrast by using preset PR1.

GPS and GSM Module INTERFACE (RS232)

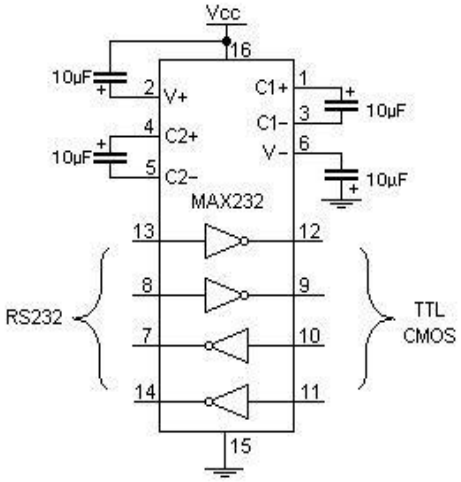

Fig 5. RS232

The RS232, also more commonly known as the serial, specifications specifies that logic '1' is represented by +12.5V and a logic '0' is represented by -12.5V. This obviously presents many problems for micro controller that are running at +5V. That is where the level converter comes into play; it converter -12.5V to 0V and 12.5V into 5V, standard TLL logic levels. This makes interfacing with the micro controller extremely easy.The schematic shows the simplicity of the design by using one of IC's level converters.. This is handy in many cases when you only want to use the Transmit and Receive data Lines. You don't need to use two chips, one for the receive line and one for the, The signals to and fro of microcontroller and GSM are sent through MAX232.The converter uses the MAX232 (U3) converter IC. The connection of MAX232 to the GPS and GSM uses the RS232 data cable.

VI. CONCLUSION:

In this project we defined a complete solution for detecting the all type of accidents that occurred on roads. conditions (i.e. dense fog) by decreasing the speed,
even though the accident occurred the vibration or MEMS sensor will activate the GPS to find the location and further SMS will send to emergency care center. This will optimize accidents as well as human death ratio by accidents due to providing proper care with in time frame. As an additional we also added fire sensor to detect fire accidents. Thus this system will provide a vital information about the accidents, however such prompt system is not available in the country.

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