CAN BASED VEHICLE HEALTH MONITORING SYSTEM

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Abstract: This paper deals with developing an embedded system for detecting the vehicle condition by monitoring the internal parameters that are used in evaluating the vehicle's current health condition. Traveller information plays a critical role in supporting safety, security, mobility, and in improving the reliability of travel. This traveller information can be a continuous data on performance of the vehicle and the status of its internal components. In this project, Controller Area Network (CAN) is used for communicating between the ARDUINO and the connected sensors. CAN helps in monitoring sensor data. This device is basically based on ARDUINO system which is the heart of this project that controls vibration detection sensor, alcohol detection sensor, ultrasonic sensor and temperature sensor are used. These sensed data are transferred to the controller in the form of packet frames and by using Global System for Mobile (GSM) and public mobile network services all the information can be transferred to web server and mobile phone. Many systems are developed for sensor monitoring.

1. INTRODUCTION

This system is based on the CAN bus technology, to extract the vehicle's status or fault information. The increasing complexity of automotive electronic control system makes automotive fault diagnosis and maintenance work more difficult. Transfer of large amount of data and exchange of different signals between electronic control systems on the bus vehicle is essential. Therefore vehicle interior network came into existence. CAN is basically relying on its stability performance, low price, high reliability and real-time information which is been widely used in automotive internal network. GSM technology is used for sending information of vehicle status when faults are detected.[1,2] In recent years the safety and health is very important irrespective of human being or machines, in our project we are trying to explain and prove how car safety and health matters. So we are using CAN communication protocol for making a convenient communication between Electronic Control Unit (ECU) to ECU. Once the data fetching is done ECU push the data to dash board ECU for process and display. If vehicle met in to an unexpected accidents the vehicle itself transfers the sensed data of the vehicle's condition to responsible person (Emergency contacts).[3,4]

The main purpose of an accident avoidance system is to reduce the chances of collision and also continuous monitoring of the health parameters of driver and also the vehicle environment. Mostly accidents occur due to driver's carelessness and also the cases of drunken driving. Alcohol detection, temperature detection of engine, obstacle detection and early collision detection are used to reduce the frequency of accidents. In this paper we proposed a low cost, efficient system.[5]

2. BACKGROUND THEORY

CAN is serial communication bus for real-time control application which operates a data rates up to one megabits per second, and has excellent error detection and confinement capabilities. CAN was originally developed by the German company Robert Bosch to provide a cost effective communication bus for cars.

The car industry continues to use CAN for an increasing number of applications, but because of its proven reliability and robustness. CAN is now also being used in many other control applications. CAN is a robust industrial strength hardware and software protocol used to communicate between microcontrollers. It is very popular in modern automotive applications and is gaining popularity in industrial and home automation applications.[5,6]

Fig.2.1 Accident details tracking through mobile

Working Principle: Data messages transmitted from any node on a CAN bus do not contain addresses of either the transmitting node, or of any intended receiving node.

3. SYSTEM REQUIREMENT

To obtain the desired result we require a system which is reliable, secure and also efficient. The system requires compact package of hardware and software. It must fulfill the necessary qualities such as real-time continuous monitoring and exact statistic series. It must support mobility and less power consumption.

3.1 HARDWARE ARCHITECHTURE

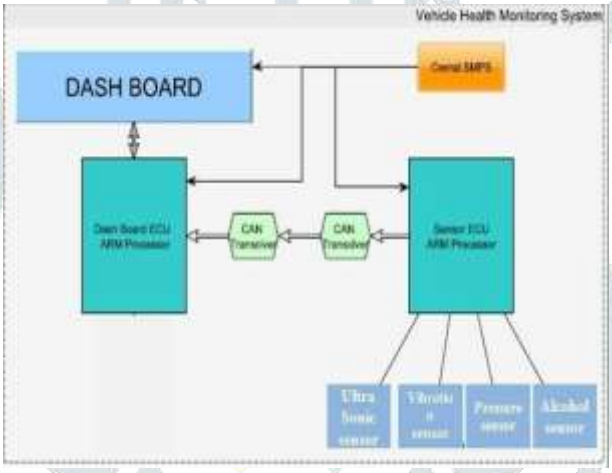

Fig3.1: Block diagram of vehicle health monitoring system

The hardware structure mainly integrates CAN bus controller where ARDUINO is used as the main control module. The block diagram of CAN based vehicle control system consist of ARDUINO controller and the engine control module which controls the vehicle status with various sensors which are alcohol sensor, temperature sensor, vibration sensor and ultrasonic sensor. The controllers controls the status of the vehicle and sends the feedback to operator panel by providing digital information.[7,8]

3.2 SOFTWARE ARCHITECHTURE

The vehicle control system is programmed using embedded C language. Software of the system have two parts in which one is the program working with control module and another one is monitoring and running on the PC.[9]

After power supply CAN control building function is being initialized. Now all the data which are read from the sensors are processed to the LCD screen and to the mobile device.[10]

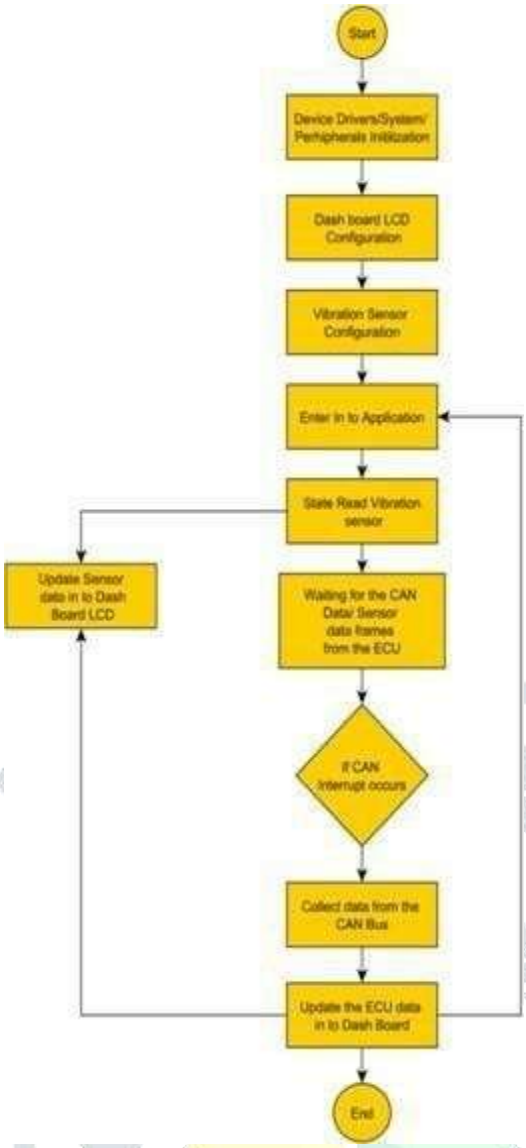

Fig3.2: Flow chart

3.2 SENSORS

3.2.1 Vibration detection sensor

Fig.3.2 (a): Vibation sensor

It is used to observe the collision of vehicle which is sensed due to vibration and shocks during accident. Sending the accident details to the nearby hospitals, police station and emergency contacts with the help of GSM support.

3.2.2 Alcohol detection sensor

Fig.3.2 (b): Alcohol sensor

Drowsiness of driver can cause mishap evasion that can be a reason of death. MQ3 sensor with breath analyzer is used here to check the liquor level.[11]

3.2.3 Temperature sensor

Fig.3.2(c): Temperature sensor

The temperature sensor is used to measure the temperature of the engine. The readings from this sensor are then fed back to the engine control unit (ECU), which uses this data to adjust the fuel injection and ignition timing.

3.2.4 Ultrasonic sensor

Fig.3.2(d): Ultrasonic sensor

It is used to detect the distances between the car and obstacles. It is based on the echolocation process. Transmitted sound waves bounced back and retrieved with some time difference that helps to calculate the distance.

3.2.5 Arduino

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet)[15,16]. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button.[12,13]

3.2.6 LCD Display

Liquid – crystal display (LCD) is a flat panel display that uses the light modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead they use a backlight or a reflector to produce images in color. The main advantage is that it is very compact, thin and light and also it is less power consuming. They are used in wide range of applications including computer monitors, television etc.[14]

4 RESULTS & CONCLUSION

Fig.4.1:LCD Display

Unit to test	Test data	Steps to be executed	Expected result	Actual result
Vibration sensor	Frequency less than 500hz	Car is safe, no change	Data send to the CAN protocol	User will not be notified
	Frequency greater than 500hz	Accident occurred, send message to emergency contact	Data send to the users phone followed by CAN	User is notified
Ultrasonic sensor	Calculates the distance between the car and obstacle	The data will be send to the controller followed by CAN.	Data will be displayed on the dashboard	Driver will be notified
Temperat ure sensor	Measure the temperature of car engine	The data will be send to the controller followed by CAN	Data will be displayed on the dashboard	Driver will be notified
Alcoholic sensor	Check the liquor level of the driver	The data will be send to the controller followed by CAN.	Data will be displayed on the dashboard	Driver will be notified

Table1: Test data

5 CONCLUSION

The project CAN based vehicle health monitoring system is intended for secure and smooth journey. The car/ vehicle itself is aware of its movement. If the driver himself is not concentrating on driving or any other parameters, which may cause damage to vehicle as well a life, this intelligent car/ vehicle warn the driver regarding the danger ahead. As the value of a human life is countless times more than the cost of this project, we are proud to be behind the success of this project.

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