CAN Based Vehicle Health Monitoring System

Swathi M C, Dilnavincent, Navya S.R, Muhajira U P, Usharani J*

Department of Computer Science and Engineering, GSSS Institute of Engineering and
Technology for Women, Mysuru, India

* Corresponding author email: usharani@gsss.edu.in

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. Traveler information plays a critical role in supporting safety,
security, mobility, and in improving the reliability of travel. This traveler information can
be a continuous data on performance of the vehicle and the status of its internal
components. In this project, 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 GSM/GPS and public mobile network services all the information can be
transferred to web server and mobile phone. Many systems are developed for
sensormonitoring.

Index Terms - CAN, ARDUINO, MQ3, ECU

1 INTRODUCTION

This system is based on the widely used 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 (Controller Area
Network, CAN); relying on its stability performance, low price and high reliability and real-
time, has now been widely used in automotive internal network. GSM and GPS technology
are used for sending information of vehicle status when it faults are detected. The GPS system
will provide location and time. GPS provides accurate location and time information for an
unlimited number of users in all weather, day and night, anywhere in the world. It has the
advantages of a wide coverage, high accessing speed, charging according to the flow rate.
In recent years the safety and health is very important irrespective of human being or
Machines, in our project we were try to explain and prove how car safety and health matters.
So we were using CAN Communication protocol for ECU to ECU communication and

there is devices called Sensor ECU and Dash board ECU, sensor ECU read the Temperature, Air Pressure, Quality of the Air inside the Vehicle, once the data fetching is done ECU push data to Dash board ECU for Process and Display, If vehicle met in to unexpected accidents the vehicle it 'self-send the sensor data and location of the Vehicle to responsible persons (Emergency contacts).

The main purpose of an accident avoidance system is to reduce the chances of collision and continuous monitoring of the health parameters of driver and also the vehicle environment. Speeding, drunk driving, sudden fall of pulse rate and seat belt adjustments all lead to accidents.

2   RELATED WORK

CAN: The Controller Area Network (the CAN bus) is a serial communications bus for real-time control applications operates at data rates of up to 1 Megabits per second and has excellent error detection and confinement capabilities. CAN was originally developed by the German company, Robert Bosch, for use in cars, to provide a cost-effective communications busforin-carelectronicsandasalternativetoexpensive, cumbersome and unreliable wiring looms and connectors. 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 or Controller Area Network 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 automationapplications.

Figure 1: accident details tracking through mobile

Proceedings of the 3rd National Conference on Image Processing, Computing, Communication, Networking and Data Analytics (NCICCNDA 2018)

137

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 SYSTEMREQURIMENT

To obtain the desired results we require a system which is reliable, secure and also efficient. The system requires compact package of hardware and software. It must full fill the necessary qualities such as real-time continuous monitoring and exact statistic series. It must support mobility and less powerconsumption
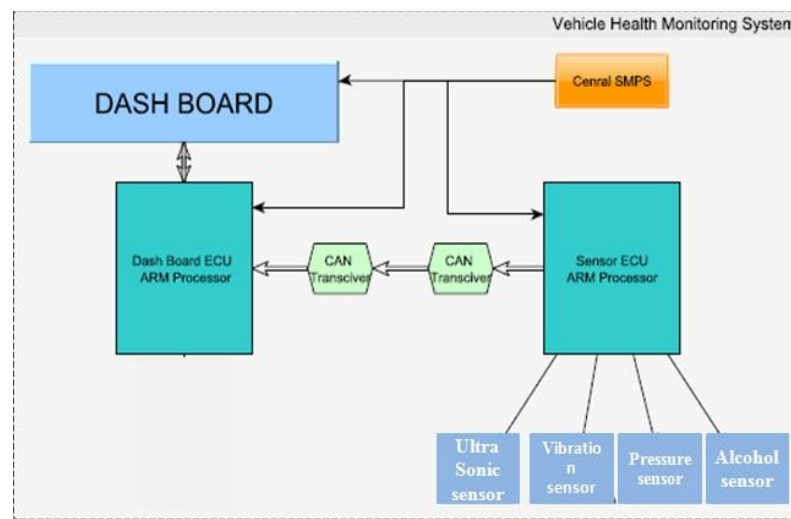
3.1 Hardware architecture

Figure 2: Block diagram of vehicle health monitoring system

The hardware structure mainly integrates the CAN bus controller, ARDUINO as the main control module, Temperature, Ultrasonic sensor (obstacle detecting sensor), Vibration sensor, alcohol sensor ,LCD displaytoprovide digital interface and other accessories. 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. The controllers control the status of the vehicle and sends the feedback to operator panel by providing digitalinformation.

3.2 Software Architecture

The vehicle control system is programmed using the embedded C. software of the system have two parts one is program working with control module and another one is monitoring and logging of and running on the PC. After power supply and device driver initialization CAN control building function i.e. CAN init() etc. being initialized. Now read the sensor port processes the data and output it on the LCD screen and mobile device
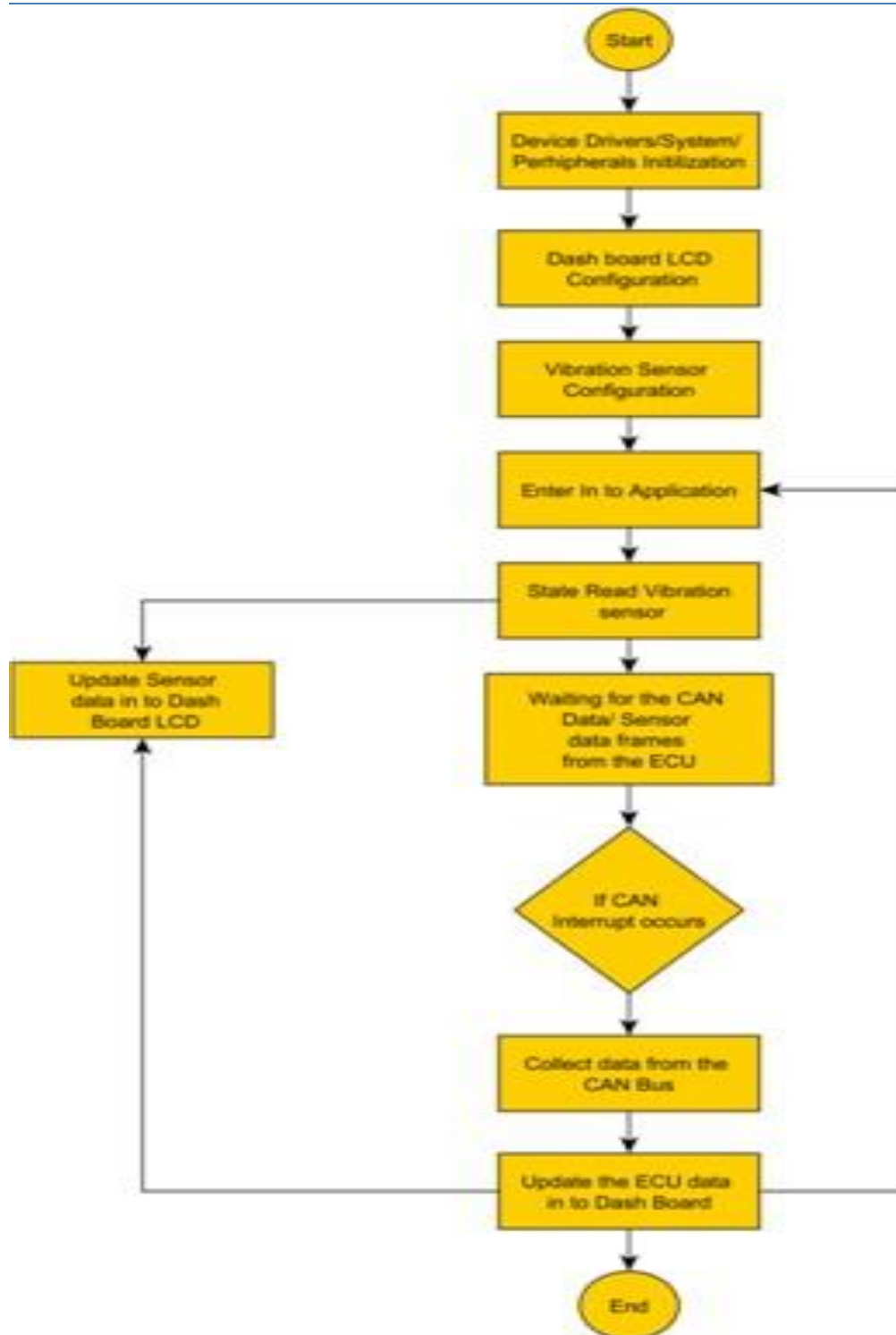
Figure 3: Flow chart

Proceedings of the 3rd National Conference on Image Processing, Computing, Communication, Networking and Data Analytics (NCICCNDA 2018)

139

3.3   Sensors

3.3.1   Vibration detection 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 using GSM and GPSsupport.
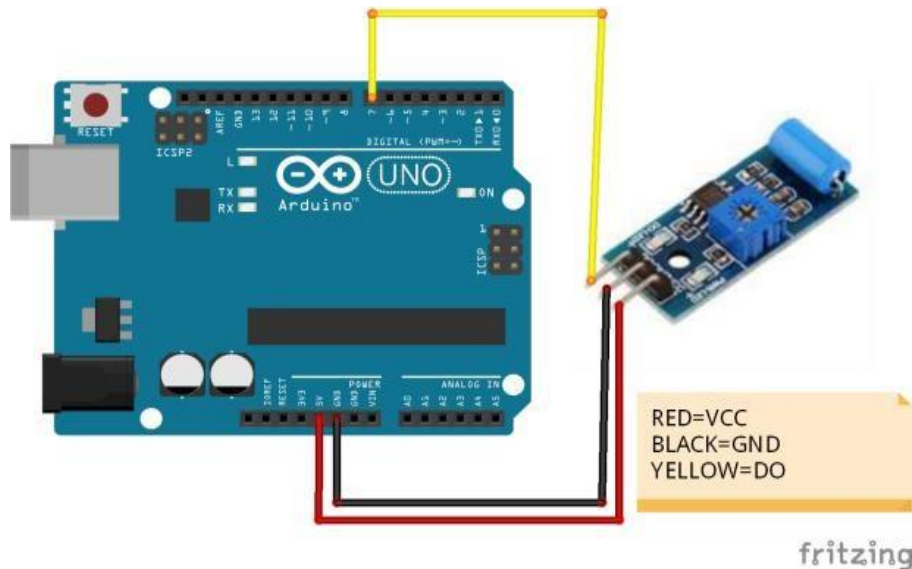

RED=VCC
BLACK=GND
YELLOW=DO

Figure 4: Vibration sensor

3.3.2   Alcohol detection 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.
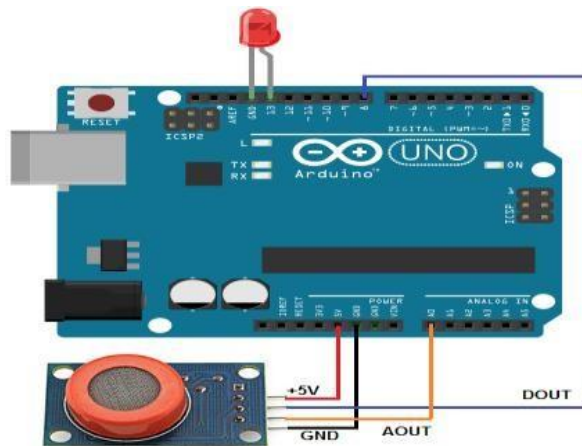

Figure 5: Alcohol sensor

3.3.3 Ultrasonic sensor

It is used to detect the distances from obstacles thy col- lision can be avoided. It is based on the echolocation process. Transmitted sound waves bounced back and retrieved with some time difference that helps to calculate the distance.
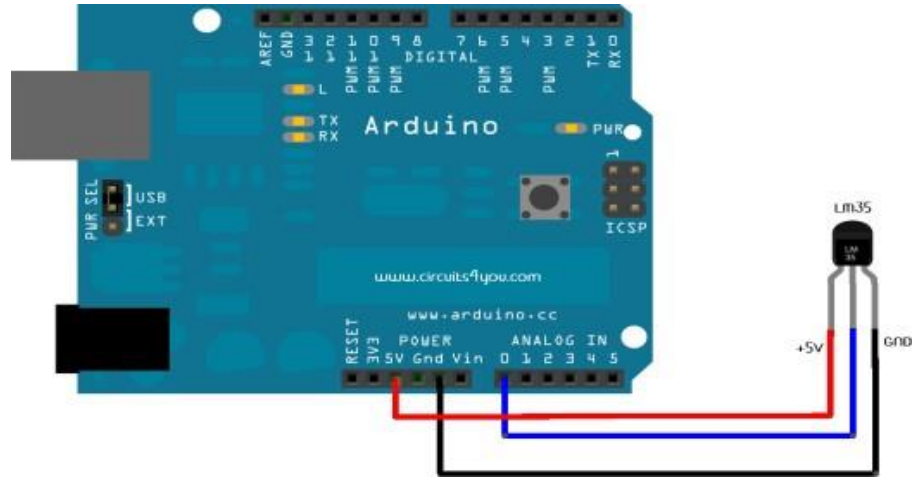

Figure 6: Ultrasonic sensor

3.3.4 Temperature detection sensor

The temperature sensor is used to measure the temperature of the engine of an internal combustion 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 ignitiontiming.
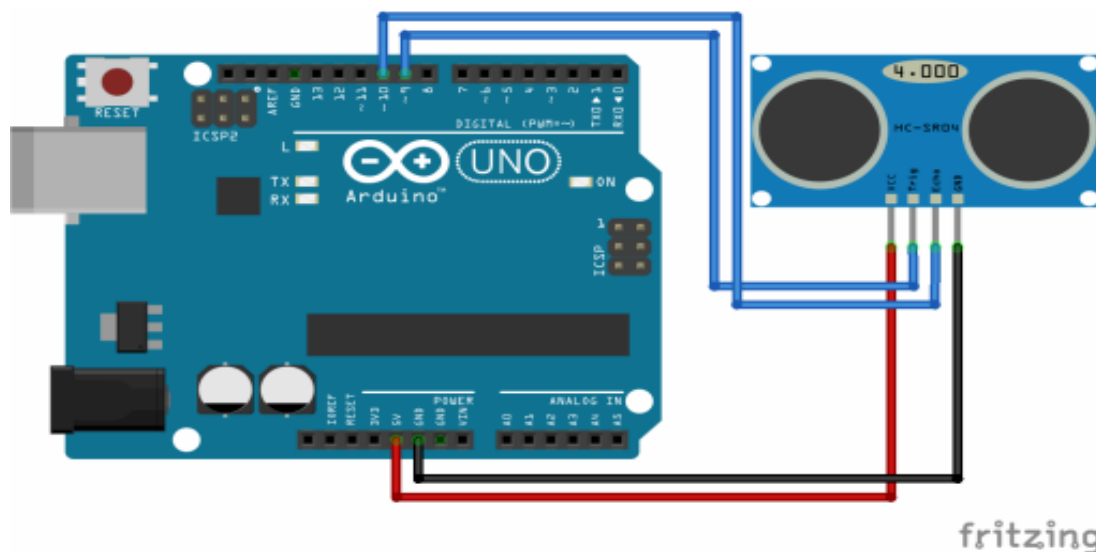

Figure 7: Temperature sensor

Proceedings of the 3rd National Conference on Image Processing, Computing, Communication, Networking and Data Analytics (NCICCNDA 2018)
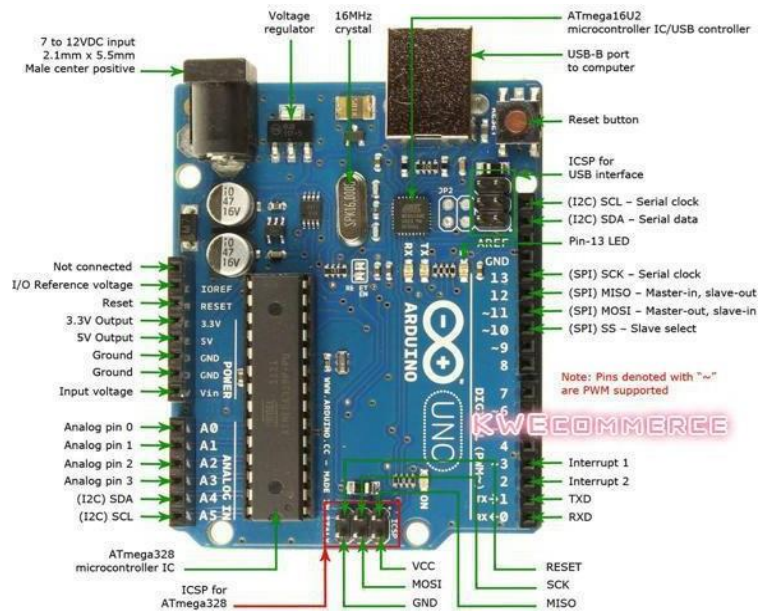
141

3.4 ARDUNIO

Figure 8: PIN configuration of ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). 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 resetbutton.

4 CONCLUSION

The paper focuses on vehicle health monitoring system based on CAN bus, which can be used to improve the efficiency of monitoring, to maintain the system security, to lower the maintenance costs as well as the operating expensed. With the development of the mobile technology, the design will be made better; the data transmission based on wireless communication will be used more widely. Thecommunication network designed is able to stay stable in a long run in the experiment and meets the expected target. In future we can extend this project further by connecting more devices to make configuration of a vehicle health monitoring system more effective

REFERENCE

[1]   P.Visconti,G.Cavalera "explain the intelligent system for monitoring and control of photovoltaic plants and for optimization of solar energy production"
[2]   P.Costantini "proposes the design of electronic programmable board with user-friendly touch screen interface for management and control
[3]   J Han,C.Choi WanKi Park llwoo Lee,"proposes the smart Home energy management system including renewable energy based on ZigBee and PLC"
[4]   T.Obaid,H.Rashed,M.Tarique" explains the ZigBee Technology and its application I wireless Home Automation systems".