Hardware Implementation of Dynamic Logic Construction of Vehicle Health Monitoring and Controlling System using Can Protoco

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Abstract-Now a days, the automobile growth reaching peak to peak and shows well developing technology which are more useful to us. Every vehicle needs repair after certain period of time to maintain the vehicle at a good condition which prevents the fault occurs during running of the vehicle. The objective of the paper is to build both hardware and software that connect together to communicate with CAN network which extract the message for reliable vehicle health communication. Driving safety has been attracting more interest due to the unfavorable condition that occur during middle of the running which leads to accidents. CAN is a text message-based protocol designed especially for automotive applications. The key idea of the proposed application has been simulated using Proteus software and the simulation results showed better performance and it has been implemented by hardware for better understanding of the proposed system. It is low cost and easy to implement. It also shows the condition of vehicle such as engine temperature, air pressure, door contact, gas and controlled by main controller.

Keywords—CAN, Vehicle Health Monitoring, Embedded Systems, engine temperature, air pressure, gas, and door contact.

I. INTRODUCTION

Many of today's vehicles include a wide range of systems and elements that perform colorful operations while the vehicle is in use. Over time, repeated use of the vehicle may cause failure of individual systems or elements. The failure of one element or system affects the overall performance of vehicle. For perpetual better performance of vehicle, the stylish way is to carry out specified periodical examination and form in a prescribed way. It requires times of experience to check manually, therefore the electronic vehicle health monitoring system is to be designed. Monitoring systems are widespread in current world. They are being considerably employed to cover colorful parameters of a system or a reality. To name a many, we come across covering system to read the health of a case; covering systems to control the data and voice dispatches and in numerous other fields. Monitoring systems are bias that automatically cover measures, collect the state data, and store them for later purposes. The state data is collected at periodic intervals or at times when a certain parameter exceeds a limit which is unique to each parameter.In recent days, further vehicles are producing in different model with further features. There are veritably lower options for vehicle safety monitoring process. We cannot suitable to know the problems passed during the period of trip or driving. In particular, x-by-wire systems are appearing and drive exploration sweats of the whole automotive assiduity for the recent decade. An ultramodern machine can correspond of over to 70 ECUs, seeing and taking tabs of the colorful parameters of the machine. This rapid-fire and complex exchange of signals ensures the proper functioning of the auto or vehicle. The Controller Area Network (CAN) protocol was introduced to palliate the

problem of transferring these signals efficiently, in the form of structured communication frames called CAN dispatches. With the arrival of Vehicular Sensor Network that allows vehicles within reasonable propinquity to connect having seen the bigger picture, we now concentrate on the constructing results that have the capabilities of rooting the demanded CAN dispatches from a machine. Electronic Control Units (ECUs) are decreasingly being stationed in motorcars to controls one or further electrical subsystems to realize the colorful functions. When a motorist drives an auto, there are numerous signals that are passed between the colorful ECUs embedded inside the auto. Affair signals from an ECU contain information about the current state of the auto as the motorist interacts continuously with the auto. CAN machine is a vehicle machine standard designed to allow microcontrollers and bias to communicate with each other within a vehicle without a host computer. CAN is a communication grounded protocol, designed specifically for automotive operations but now also used in other areas similar as artificial robotization and medical outfit. Then we introduce new technology for showing the vehicle health status on the screen while the key is turned on as well as period of vehicle handling. This paper is organized as follows: Related works on vehicle health monitoring has been presented in section II. The details of existing system is briefed in section III and the proposed CAN based vehicle health monitoring system is explained in section IV. The simulation results obtained by simulating the proposed one using Proteus software has been discussed in section V. Hardware implementation of the proposed system has been detailed in section VI and the experimental results has been discussed in section VII. Finally, the concluding remarks is presented in section VIII.

II. RELATED WORKS

Xiaolu Zeng et-al has proposed in-vehicle sensing for smart cars digital object identifier to provide a comprehensive review of the motivation, applications, state of the art developments, and possible future interests in this research area. According to the application scenarios, we group the existing works into five categories, including occupancy detection, fatigue/drowsiness detection, distraction detection, driver authentication, and vital sign monitoring, review the fundamental techniques adopted, and present their limitations for further improvement.Ryota Nakamura et-al has proposed Virtual Network Control for Power Bills Reduction and Network Stability which is a control method to achieve both reduced power bills and stable network operation when the electricity unit price differs among areas and time periods. To begin with, the problem to minimize power bills is formulated, and to solve it quickly, a heuristic search method is proposed that utilizes network centrality. In addition, we formulate a multi-objective optimization problem characterized by parameter normalization, and simulation results show that the proposed control method can reduce power bills while suppressing the number of network reconfigurations. Ge Zhang et-al has proposed 10 - Gigabit Industrial Thermal Data Acquisition and Storage Solution Based on Software-Defined Network as solution for the face of increasingly large real time industrial data, existing log collection systems and timing data gateways, such as packet loss and other phenomena, cannot be more complete preservation of industrial control network thermal data. The emergence of software-defined networking provides a new solution to realize massive thermal data collection in industrial control networks. This paper proposes a 10-gigabit industrial thermal data acquisition and storage scheme based on software defined networking, which uses software defined networking technology to solve the problem of insufficient performance of existing gateways.

Eungha Kim et-al has proposed a system to overcome difficultly to provide remote ultra-precision services through an internet-scale wide area network i.e., centralized ultra - precision service control system for providing ultra-precision services in large-scale deterministic networks which provides in-time packet forwarding method and on-time packet forwarding method in a large-scale deterministic network to provide ultra-precision services.

Yuki Takei et-al has proposed a technique i.e., fine-grained network identification and control combining routers and programmable switches. This technique enhances the control of existing user communication in large-scale networks such as carrier networks, by utilizing the large amount of user-premises equipment and terminals already installed without modifying as much as possible. The packet identification in commercial routers involves not only identifying the destination address by the routing table but also filtering the arriving packets for access control.

Xiang Yan et-al has proposed a system collaborative optimization design for centralized networked control system. They propose a collaborative optimization design for a kind of centralized networked control system based on jitter. After the analysis of the network delay and jitter on the performance of the Train Networked Control System (TNCS) based on the MVB (Multifunction Vehicle Bus) network, the proposed strategy modifies the media allocating model of MVB directly related to the performance of the control system. Under the premise of ensuring the stability of the control system, and considering the impact of transmission jitter on the dynamic performance of the closed-loop control, this collaborative design method can minimize the network resource occupancy rate of the subsystem.

E. Chandrasekhar et-al [10] has proposed vehicle health monitoring system. The monitoring of cars is very much important as the firm holds large number of cars and the tracking of each car's health being used by the customers simultaneously is the primary concern. These challenges can be tackled with the help of On-board diagnostics. On-

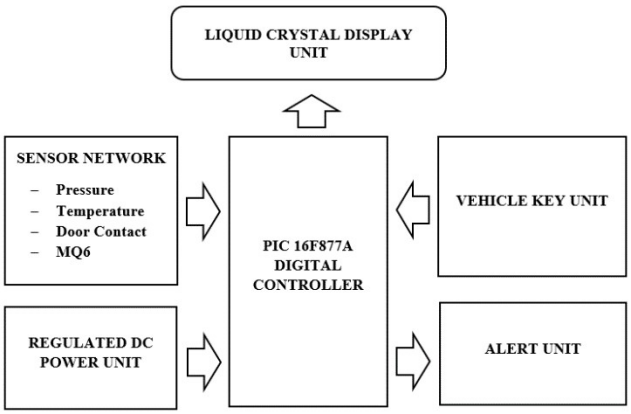
board diagnostics is an automotive term referring to a vehicle's self-diagnostic and reporting capability. OBD systems give the vehicle owner or repair technician access to the status of the various vehicle subsystems. The amount of diagnostic information available via OBD has varied widely since its introduction in the early 1980s versions of on-board vehicle computers. Early versions of OBD would simply illuminate a malfunction indicator light or "idiot light" if a problem was detected but would not provide any information as to the nature of the problem. Juan Guerrero-Ibanez et-al has proposed sensor technologies for intelligent transportation systems. Automotive manufacturers are developing in-vehicle sensors and their applications in different areas including safety, traffic management, and infotainment. Government institutions are implementing roadside infrastructures such as cameras and sensors to collect data about environmental and traffic conditions. By seamlessly integrating vehicles and sensing devices, their sensing and communication capabilities can be leveraged to achieve smart and intelligent transportation systems. We discuss how sensor technology can be integrated with the transportation infrastructure to achieve a sustainable Intelligent Transportation System (ITS) and how safety, traffic control and infotainment applications can benefit from multiple sensors deployed in different elements of an ITS.

III. EXISTING SYSTEM

Driving safety has been attracting more interest due to unfamiliar proliferation of vehicles and the posterior increase of traffic accidents. As such the exploration community has been laboriously seeking results that can make vehicles more intelligent and therefore ameliorate driving safety in everyday life. Among all the subsisting approaches, in- vehicle sensing has become a great preference by monitoring the motorist's health, emotion, attention, etc., which can offer rich information to the Advanced Driving Assistant Systems (ADAS) to respond consequently and therefore reduce injuries as important early as possible. There have been numerous significant developments in the past few times on in- vehicle sensing. The thing of this paper is to give a comprehensive review of the provocation, applications, state of the art developments, and possible coming interests in this exploration area According to the application scenarios, we group the existing works into five orders, including occupancy detection, fatigue/ doziness detection, distraction detection, motorist authentication, and vital sign monitoring, review the abecedarian ways espoused, and present their limitations for farther advancement. Eventually, we bandy several coming trends for enhancing current capabilities and enabling new openings for in- vehicle sensing.

IV. PROPOSED SYSTEM

In the proposed system, the predesigned program is designed and stored into controller which is used to calculate the sensor values. The controller activated the buzzer unit when the sensor values are cross the reference value. We can use different types of sensors which are used to detect different parameters of the vehicle unit such as air



pressure of the tyre, gas level of the air conditioner, temperature level of the engine and door contact.

In vehicle, the key unit has the master control of the system and others sensors which act as slave to the master. When the key unit is ON, it can get condition of the vehicle which displayed through LCD display and when the sensors cross the reference value and it indicates condition of the vehicle whether it is abnormal or bad condition.

The system consists of different sensor network such as MPS20N0040D air pressure, MQ-6 gas sensor, thermistor which act as temperature sensor, hall effect sensor used for door contact (whether it is open or close) and PIC16F877A microcontroller, buzzer, +5V regulated power supply unit and 2x16 LCD display unit. All the sensors output connected with ADC (Analog to Digital Converter) port of the controller.

Fig. 2. Circuit Diagram of the Proposed CAN based Vehicle Health Monitoring System

The reference value shows the vehicle is normal and good condition. The sensor value crossed the reference value and it shows the vehicle health is abnormal or bad condition. The controller activates the buzzer unit when the

values are crossed reference value. The door switch is used to detect the vehicle door position. The 2x16 LCD display unit is interfaced with microcontroller which is used to displays the information about the vehicle health status.

V. Simulation Results

This section shows the simulation output of the proposed system of vehicle monitoring system using CAN protocol using the proteus software. Also, the results of the simulated output have been discussed in this section. The advantage of the simulation software is to provide the pre model of the vehicle health monitoring system without using any physical hardware components. Proteus software is the most used simulation software for proposed system. Once the vehicle starts the proposed systems can check the vehicle condition. After checking, if the vehicle conditions exceed its reference value the system shows alert in the LCD display.

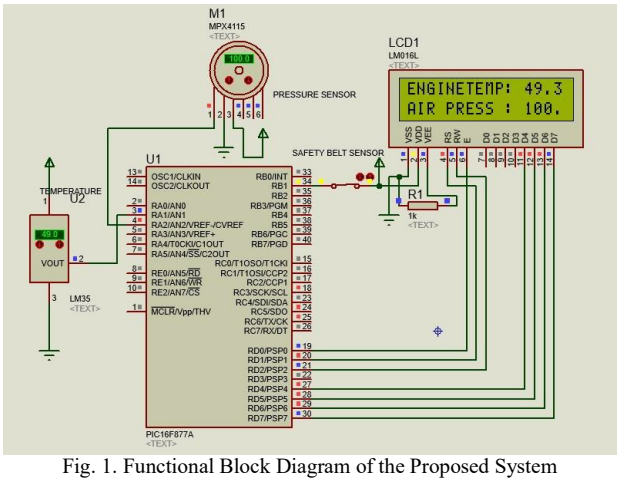


Fig. 1. Functional Block Diagram of the Proposed System

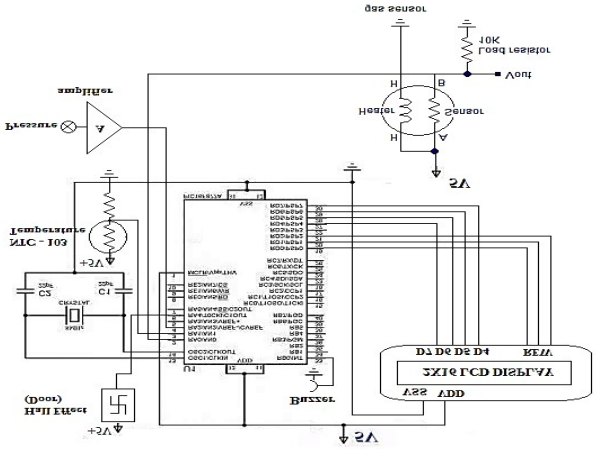
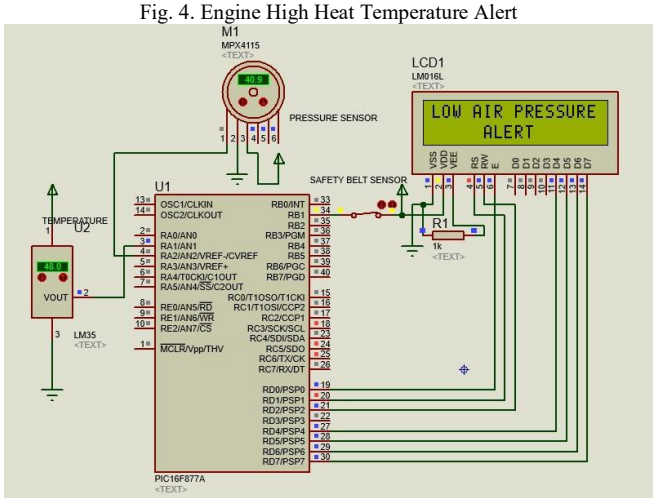


Fig. 3. Indication of Vehicle Health Monitoring System

Fig. 4. Engine High Heat Temperature Alert



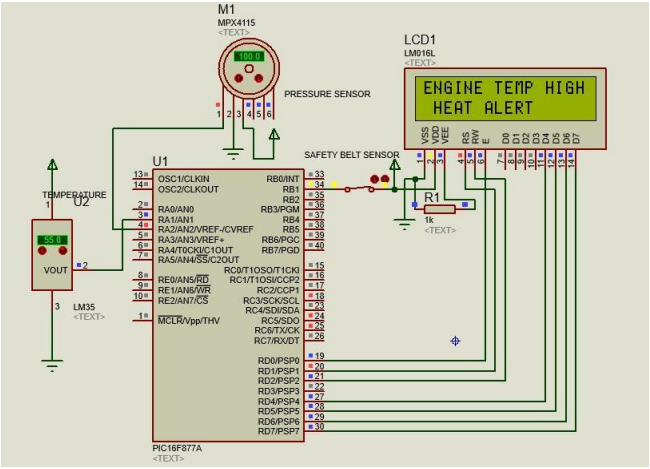


Fig. 5. Vehicle Tyre Low Air Pressure Alert

VI. HARDWARE IMPLEMENTATION

In this section, we can show the hardware implementation of the proposed system of vehicle health monitoring system using CAN protocol in Figure.6. The hardware implementation of the proposed system helps to analyze the detailed view of the system. The vehicle key unit which acts as master control and controls slave sensors by using CAN protocol (i.e., health monitoring sensors) such as NTC-103 thermistor temperature sensor, air pressure sensor for tire, MQ-6 gas sensor and hall effect sensor for door contact.

Fig. 6. Schematic View of the Proposed System

Fig. 7. Vehicle Key Unit Ignition Status

The Figure.7 shows the vehicle key unit ignition status and it has the master control of the proposed system. When the key unit is ON, it can get health information about the vehicle by using sensors.

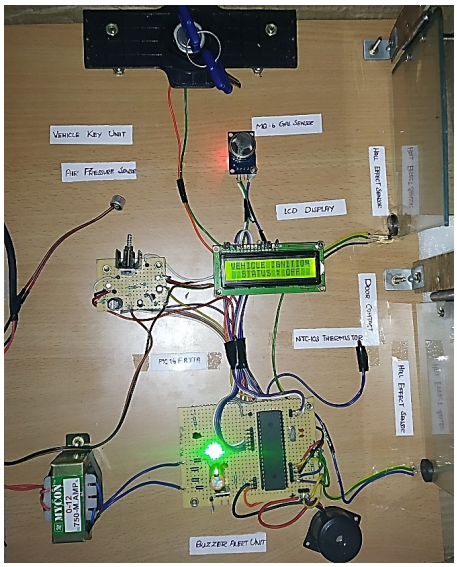
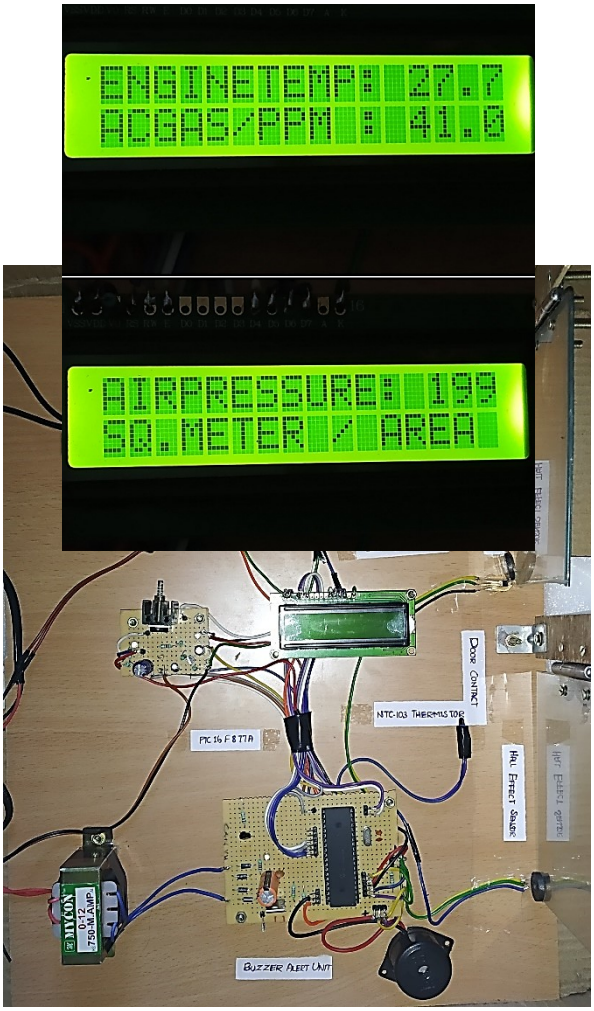


Fig. 8. Indication of Condition of the Vehicle



Once the key unit is ON, the proposed system shows the vehicle health through LCD display and it was shown in the Figure.8.

VII. Experimental Results

This section shows detailed information about the hardware implementation of the vehicle health monitoring and controlling system using CAN protocol.

Table - I Vehicle Key Function

Key Status	LCD Information
ON	Vehicle Parameters Displayed
OFF	Engine Ignition Off

Table - II CAN Function

Sensor	Values	Vehicle Health	Buzzer
GAS	>300	AC gas poisoned Smoke Fire Alcohol	Enable
NTC – TEMP	>30	Engine high temperature	Enable
PRESSURE	>230	Air level of the tyre is abnormal	Enable
HALL EFFECT	<25	Door contact is open	Enable

The table I and II explains, the vehicle key unit status and the reference value of each sensor. When the sensor value crossed the reference value, it gives alert by using buzzer about the condition of the vehicle.

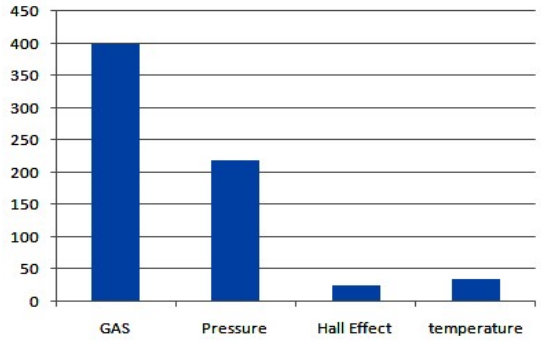


Fig. 9. Experimental Analysis of the System

The Figure.9 which shows the experimental analysis of the system, it gives alert by using buzzer when the sensor value above the reference value. i.e., above 300 gas sensor gives alert, above 30 which indicates high temperature, above 230 for air pressure sensor, and below 25 which indicates the door is open through the LCD display for the user.

VIII. Conclusion

The vehicle health monitoring system provides proper information about the parameters of the vehicle. This continues information will lead to early indication of damage and we can pre diagnose future fault which leads to better performance of vehicle. Vehicle health monitoring system will allow us to inspect our vehicle though we are beginner or not skilled in inspecting. The system is very useful to find the vehicle health status and generate the alert

signal if any problem is occurred during the vehicle running. It predicts accurately and telecast through display unit. The implementation of the system is very low-cost expense and easy to design. In future, we will add some improvements to this system which helps to maintain the vehicle in better condition and avoids problems during travelling in that vehicle.

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