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Can Based Fault Finding System for Vehicle Using I2C Bus

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ABSTRACT

Now a days automotive electronics is rapidly advancing in driver assistance system. Current vehicles generally use different networking protocols to integrate these driver assistance systems into vehicle, like RS 232, RS 422 and RS 485. These protocols are only used to transport the message. It is required to find the faults which occur in vehicles. Existing protocol does not meet this requirement. CAN(controller area network) is an attractive solution for it with the embedded control systems due to its low cost, light protocol management, the deterministic resolution of the contention and built-in features for error detection and retransmission. Fault confinement is a major benefit of CAN. This paper explains design and development of CAN bus protocol using I2C bus for monitoring the vehicle's parameters like blown fuse indication, temperature and controlling.

Keywords: Real-Controller area network (CAN), I2C Bus, Embedded System.

1. INTRODUCTION

In the automotive industry, an embedded control system has grown from stand-alone systems to highly integrated and networked control systems [1].

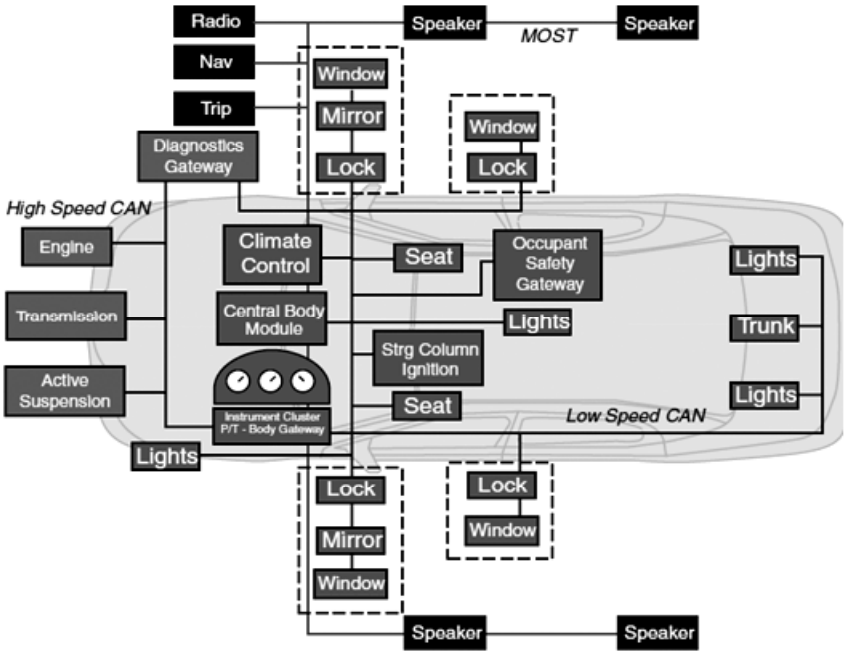

Figure 1: Typical Automotive Network [2]

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Modern automobile have more microprocessors. These microprocessors are communicating over several networks, to manage infotainment systems, central locking mechanisms, lighting systems and other vehicle systems. The most commonly used network for control in automotive and manufacturing applications is the CAN or Controller Area Network. CAN is a serial communications protocol suited for networking sensors, actuators, and other nodes in real-time systems [2]. The CAN was mainly developed for new functionality, but it also reduced the complexity of wiring. Today, CAN controllers are used for integration purpose. These CAN controllers are integrated on many microcontrollers and cost of these CAN controllers is very low. Figure 1 shows some networks connecting automotive embedded systems. Previously, CAN protocol is used for data transferring purpose, it transfer the real time acquired data, plot data. CAN is also used for broadcasting commands and sending sensor data for control purpose. CAN was also used in IC (intermittent connection) fault detection methods. This paper discusses the design and development of CAN bus protocol using I2C bus which control by PC.

The system consists of two main parts, i.e. software that built in PC and the fault finding system itself. In this project, Design and develop CAN protocol based fault finding system using I2C bus. This system is control by PC and connection of PC through USB port to vehicle's dashboard. System monitors the parameters like blown fuse indication, temperature and controlling. System reduces the complexity of wiring and develops a centralized hub to control and also monitors the environment. In this system, I2C bus is used because it has attractive features over the SPI bus (serial peripheral interface). I2C bus interfacing is better than SPI bus interfacing. The I2C bus is popular bus. It is used for communication between a single or multiple master devices and a single or multiple slave devices. This bus is required only two bus lines due to this circuit complexity get reduced.

2. RELATED WORK

In this section the related work of CAN (controller area network) protocol is explained. CAN is design and develop for different systems like control system, automotive system and suspension system.In survey paper [3], Tejas V. Unavane, *et al.*, have developed the CAN bus application layer protocol for six DOF(Degrees of Freedom) Shake table System which is control system, in this two CAN protocols i. e CAN-A and CAN-B network application layer protocols are design and develop for transferring some parameters like real time acquired data, transferring plot data, broadcasting commands and sending sensor data for control purpose. [4] Explained the CAN-Based Real-Time Distributed Automotive Systems. In this, Security-Aware Modeling is developed for Automotive Systems. In this work Efficient Mapping is also done for CAN-Based Real-Time Distributed Automotive Systems. Security has become a critical issue for automotive electronic systems. To protect these automatic electronic systems against attacks, security mechanisms have to be applied, but the overhanging of those mechanisms may cause system performance and cause infractions of design constraints. To overcome this problem, [4] proposed an integrated mixed integer linear programming formulation. That formulation is the first to address security constraints during system mapping for CAN based systems.

In another system [5], CAN is used for the characterization of suspension systems of two-wheel vehicles with including the comfort and vehicle handling. Because of the ISO/IEC/IEEE 21451, the data which acquired from sensor are sent by GPS- General Packet Radio Service module to PC software and that implements the processing algorithm. In the paper [6], a novel model-based IC detection and monitoring method for CAN network has been developed. Same research was done by Yong Lei; *et al.* [7], in this system, fault location method is developed for IC problems on controller area networks. The survey paper [8], presents only the overview of current research on advanced intra-vehicle networks.

3. PROPOSED SYSTEM

The proposed system consist the design and development of CAN bus protocol using I2C bus for vehicle's fault finding system. This system is controlled by PC and connects the PC to vehicle's dashboard through

USB port. System monitors the parameters like blown fuse indication, temperature and controlling**.** In this system, two sensors are using therefore these two parameter are monitors.

In this proposed system, each slave will fetch their corresponding parameters like temperature, fuse status etc. and master will have a watch on the same parameters provided with byte information from slaves. Later on master will analyses the slave's data for volitation of set point and soon it exceeds the limit immediately. A control signal will be provided by master's digital pin turning on relay via transistor. Thus monitoring as well as control will be fired through I2C bus is done successfully also monitoring output will be displayed on screen using vb.net program is done for statistic view. Figure 2 shows the proposed system of fault finding system for vehicle.

In this proposed system, Visual studio 2005/8 software is used. In this system VB.Net language is used which is high level language. Length of program gets reduces, so that we can increase the efficiency of the programming. It is only non-case sensitive language on the globe. It can also reduce the time complexity of the programming.

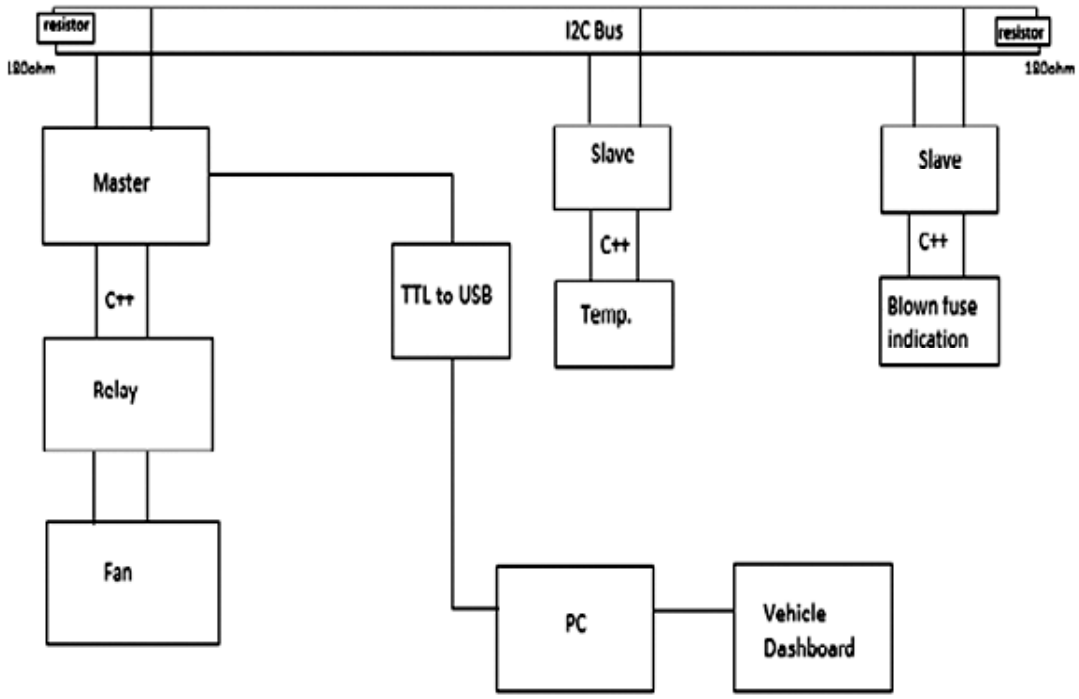

Figure 2:Proposed system of fault finding for vehicle.

The objectives of this proposed system are

1. To reduce the cost of system.
2. To reduce circuit complexity.
3. To develop a real time fast acting prototype.
4. To develop a centralized hub to control and monitor the environment.

This proposed system, useful for industrial purpose, also in vehicles for fault detection purpose.

4. CONCLUSION

As per discussed in literature survey in section II CAN is used in many systems like automotive, control. Authors observed that there is need of improvement in the vehicles systems. In current vehicles many

driver assistance systems are available like adaptive light control system, automatic braking system, automatic parking system, collision avoidance system and also blind spot detection system. But these systems are not useful for finding the faults which occurs in vehicles. Therefore, authors made the CAN based fault finding system for vehicles using I2C bus. This System monitoring the parameters like blown fuse indication, temperature and controlling**.** System reduces the complexity of wiring and develops a centralized hub to control and monitor the vehicle environment. It can be further modified by adding extra sensors for monitoring other parameters of vehicles.

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