Vehicle Parameter Monitoring Using CAN Protocol

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***Abstract*—**
Depending on applications of new era vehicle, in vehicle system Controller Area Network (CAN) architecture has been developed. with goal to reduce peer to peer wiring harness in vehicle automation system, CAN is developed as a media for data communication within the vehicle environment. The pros of CAN bus based network over traditional point to point schemes will offer increased efficiency and expandability for future technology insertions. This paper explores implementation of CAN architecture with temperature sensor and light sensor

***Index Terms*—CAN, Vehicle automation.**

I. INTRODUCTION

Today's automobile vehicles are being developed by lots of electrical parts for desired effective operation. While in case of microcontrollers as all know it is used as a central controlling unit and all the other interfaced devices or circuitries connected to it acts as a subunits for it . Due to number of connections of sensor data and electrical wires connected to microcontrollers, it becomes very complicated to analyze and troubleshoot it. This paper presents the development and implementation of a CAN based vehicle system for a semi-autonomous vehicle to improve driver vehicle dash board .The communication system in this paper is control area network CAN which is effective data transfer system. With CAN protocol it is possible to connect multiple embedded devices and other sub-devices to a unique CAN bus. for connection to CAN bus it requires a CAN transceiver in between bus and embedded devices that enables the communication over total vehicle system with great speed and priority.

This paper shows implementation of Light sensor ,Temperature sensor and respective auto control depending on threshold values of these sensors.. This paper is aimed at the implementation of CAN protocol using PIC for vehicle monitoring and control system.

The main feature of the system includes monitoring of various vehicle parameters such as Temperature, light sensor values through CAN implementation. this paper shows way to decrease requirements of Electrical wires in wire harness system of vehicle system ,in order to reduce cost and improve quality and effectiveness of wire harness system. The software part is done in Mikro C using embedded C.

Manuscript received June, 2017.
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II. LITERATURE REVIEW

In paper 'Vehicle Parameter Monitoring Using CAN Protocol ' by Pratiksha Nawale, Anjali Vekhande, Priyanka Waje published in IJCST, Volume 3 Issue 1, Jan-Feb 2015 it states that " Due to multiple connections of data & electrical lines connected to microcontroller it becomes very complex to understand & troubleshoot it. It also restricts us long distance data transfer due to large number of lines. To minimize all these problems, we can use “CAN” protocol to connect these entire network. CAN (control area network) enable us to be connected all the devices together using only two wires. Due to this, the number of lines connected with microcontroller.

It reduces greatly & circuitry becomes simple to anlyze & troubleshoot. Using CAN protocol vehicle have connected multiple microcontrollers & other devices to a common can bus like light sensor, temperature & ultrasonic sensor. " [1]

In paper 'Developing a robust CAN physical layer implementation for In-Vehicle Networks using the Robust Design Method' by Thorsten Gerke , it states that "CAN is the current In-Vehicle network standard and is a very well known protocol. Even though the protocol is well understood, implementing its physical layer is becoming more and more challenging. Vehicle manufacturers have decided to replace current low speed CAN implementations with high speed CAN solutions. This is a requirement of the increasing bus load. The number of electronic control units increases for individual CAN high speed sub-networks which makes it more challenging to ensure a robust implementation of the targeted network topology. A manual verification of the In- Vehicle network’s signal integrity in the early stage of development, where no hardware prototypes are available, is not possible due to its high transient behavior. The only choice to verify prototype topologies is through a model based design flow. A virtual In-Vehicle network implementation allows the early verification of physical layer robustness before any hardware prototypes are built-up. This allows the network developer to discover any possible issues very early and to fix them without changing any hardware implementations. This paper gives an overview of the challenges network developers face when dealing with the physical layer implementation. In addition it shows how to develop a robust implementation through a model based design method, taking into account environmental variations and component tolerances to ensure the system works even under worst case conditions." [2]

In paper" Controller Area Network for Vehicle Automation" Ashwini S. Shinde , Prof. vidhyadhar B. Dharmadhikari it states that "Based on requirements of modern vehicle, in-vehicle Controller Area Network (CAN) architecture has been implemented. In order to reduce point to point wiring harness in vehicle automation, CAN is suggested as a means for data communication within the vehicle environment. The benefits of CAN bus based network over traditional point to point schemes will offer increased flexibility and expandability for future technology insertions."

This paper describes the ARM7 based design and implementation of CAN Bus prototype for vehicle automation. It focus on hardware and software design of intelligent node. Hardware interface circuit mainly consists of MCP2515 stand alone CAN-Controller with SPI interface, LPC2148 microcontroller based on 32-bit ARM7 TDMI-S CPU and MCP2551 high speed CAN Transceiver. MCP2551 CAN Transceiver implements ISO-11898 standard physical layer requirements. The software design for CAN bus network are mainly the design of CAN bus data communication between nodes, and data processing for analog signals. The design of software communication module includes system initialization and CAN controller initialization unit, message sending unit, message receiving unit and the interrupt service unit. [3]

III. SYSTEM DEVELOPMENT

As shown in figure. 1 it explores idea of proposed system :

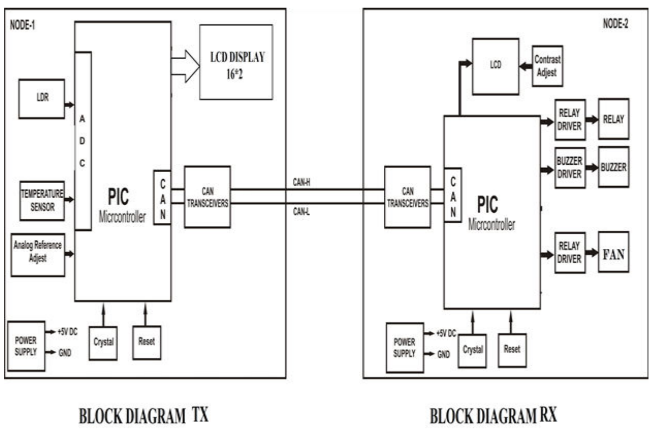

Figure. 1

As per proposed system two PIC microcontroller are used for CAN transmission and receiving. between two microcontroller data communication is to be implented, the data communication involves sensor parameters from temperature sensor and light sensor.

Depending on pre-decided threshold values corrective action takes place. MCP2515 implements the CAN specification, version 2.0B. It is capable of transmitting and receiving both standard and extended data and remote frames with 0 – 8 byte length of the data field. The MCP2515 has two acceptance masks and six acceptance filters that are used to filter out unwanted messages, thereby reducing the host MCUs overhead. The MCP2515 is interfaced with microcontroller (MCU) via an industry standard Serial Peripheral Interface (SPI). MCP2515 has two receive buffers with prioritized message storage and three transmit buffers with prioritization and abort features. The MCP2551 is a high-speed CAN, fault-tolerant device that serves as the interface between a CAN protocol controller and the physical bus. The MCP2551 provides differential transmit and receive capability for the CAN protocol controller. It will operate at speeds of up to 1 Mbs-1 at 40m length.

Typically, each node in a CAN system must have a device to convert the digital signals generated by a CAN controller to signals suitable for transmission over the bus cabling (differential output). It allows a maximum of 112 nodes to be connected and a nominal termination resistor value of 120Ω. A dominant state occurs when the differential voltage between CANH and CANL is greater than a defined voltage (e.g., 1.2V). A recessive state occurs when the differential voltage is less than a defined voltage (typically 0V). The RXD output pin reflects the differential bus voltage between CANH and CANL.

IV. FLOW CHART

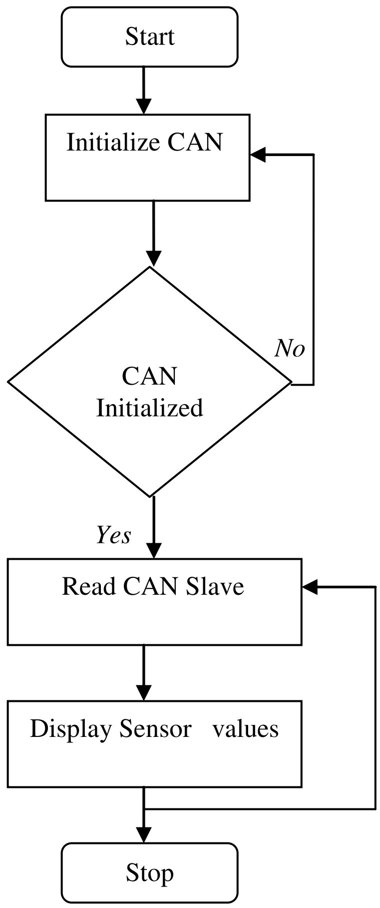

Figure. 2

IV. CONCLUSION

Proposed system has been implemented successfully. In an automobile vehicle system using CAN protocol, PIC microcontroller as a main controller , Temperature sensor, Light sensor are integrated effectively, all sub-devices in an embedded system is working properly. The Control area network which is been highlighted part of this proposed system is carrying sensor data efficiently and effectively.

it clearly shows that electric wire used in wire harness system of vehicle system is reduced drastically while speed of data transmission is also improved a lot.

ACKNOWLEDGMENT

It is all my pleasure to thank all faculties in Raisoni college of engineering, Chas , Ahmednagar to extend their hands to complete my proposed system successfully. Last but not least I would like to thank my guide Prof. Vishal Bhope to show me right path to complete my proposed system, without him it was imossible to complete this system.

REFERENCES

[1] Pratiksha Nawale, Anjali Vekhande, Priyanka Waje, "Vehicle Parameter Monitoring Using CAN Protocol " *IJCST*, Volume 3 Issue 1, Jan-Feb 2015
[2] Thorsten Gerke, "'Developing a robust CAN physical layer implementation for In-Vehicle Networks using the Robust Design Method'
[3] Ashwini S. Shinde , Prof. Vidhyadhar Dharmadhikari "Controller Area Network for Vehicle Automation"
[4] CAN – Controller Area Network, W. Lawrenz
[5] Analysis and Verification of the LIN Automotive Communication Networks using Saber, W. Lawrenz, M. Melis, Synopsys User Group Meeting 2009

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