IMPLEMENTATION OF THE CAN BUS IN THE VEHICLE BASED ON ARM 7

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Abstract

A controller area network (CAN) is mostly used to the many high level industrial protocol , due to it reducing wiring harness , tremendous flexibility, high performance ,low cost .This paper represent the CAN used in the motor car , which show different parameter by using different sensors , the different types of sensors to measure the different parameter like temperature , humidity ,gas detection & fuel level based on ARM (LPC 2129). Microcontroller ARM (LPC 2129) has inbuilt CAN controller.

Keywords: CAN bus, ARM7 (LPC2129) , MCP2551 ,MQ6 LPG gas detector , SY-HS 220 humidity detector, LM 35 temperature sensor.

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1. INTRODUCTION

In the starting days of the developing the technology, the use of Electronics Control Units (ECUs) increases rapidly . To exchange the information between ECUs , it is necessary to connect them . This is usually done by the discrete interconnection of the different system (i.e. point to point cabling) . As the use of ECUs is increases the length of cable also grown to such an extent that of several miles . This produces problem   concerning material cost , production cost & reliability .

To solve these problem we implement the CAN Bus & connect all the ECUs through that CAN bus . The CAN bus replaces all point to point cabling through a single bus . This is done by adding some CAN-specific hardware to each control unit that provides "rules" or "protocol" for transmitting & receiving the information through CAN bus . CAN bus is a simple two wire protocol. It is an asynchronous serial communication protocol . It is mostly used in automobile Industry due to it's real time performance & reliability . It is half duplex system & has data rate up to 1Mbps . It provide high level of security.

This research paper design the implementation of the CAN bus in vehicle based on ARM 7 i.e. LPC 2129 which contain inbuilt CAN controller **.** The MCP2551 is a high-speed CAN & mostly used as a voltage converter .It convert general voltage level to CAN voltage level at the transmitter & CAN voltage level to general voltage level at the receiver . MQ6-LPG is a gas sensor & is used to detect the gas leakage . It is mostly used to detecting LPG , iso-butane , propane , LNG combustible gases . SY-HS 220 is a humidity sensor & used to measure the amount of water molecule present in the air . this sensor then convert humidity into output voltage .   LM 35 series are temperature sensor ,whose output voltage is linearly proportional to the temperature in (celcius) . LM 35 ,user is

not require to subtract a large constant voltage from it's output to obtain convenient scaling . The most commonly used Character based LCDs to display the output .

2. LITERATURE SURVEY

The Robert Bosch GmbH started the development of Controller Area Network (CAN) in 1983 & officially released this protocol in 1986 at the Society of Automotive Engineers (SAE) Congress in betroit , Michigan . The first CAN chip come on in the market in 1987 , which is produced by Intel & Philips . In 1991 Bosch published the CAN 2.0 specification . Bosch originally develop the CAN controller for used in Vehicle network in 1985 .

As the technology is developing the use of Electronics control units (ECUs) also increased in the vehicle . In the starting of the developing days the different ECUs connected by discrete interconnection (i.e. point to point cabling) . This cable networking having more complexity in the system & high cost effective . The solution to this problem was introduced by using Multiplex communication to reduced complexity between different ECUs . But the Multiplex communication has not meet the real time communication requirement . In the early , 1980s there was no suitable real-time control system .The CAN protocol Internationally standardized as ISO 11898-1 to solve all these problem .

The higher level protocol of the CAN bus was developed in 1991 , CAN kingdom was introduced by Kvaser . The higher level protocol are Device-Net , open CAN , J1939 . In 1992 CAN Bus is used in passenger bus by Merecdes - Benz .
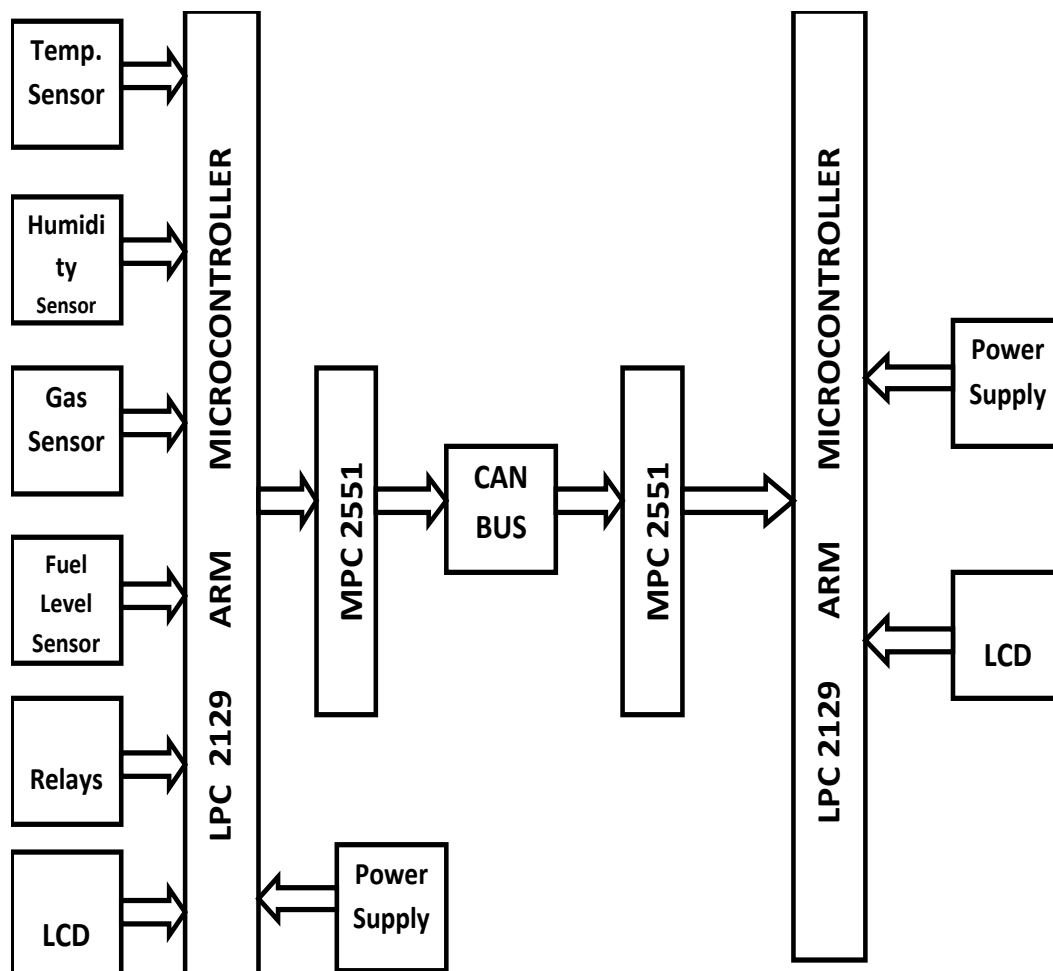
Block diagram of Proposed System

Fig 1: Block diagram of the proposed CAN Bus system

Fig. shows the block diagram of development of the CAN Bus system , which contain transmitter & receiver section . In the transmitter section different type of the sensor are used to measure the parameter like for measurement of the temperature use temp. sensor LM35 ,or humidity measurement use SY-HS-220 humidity sensor ,for gas detection use MQ6 LPG gas sensor ,for fuel level indication use the circuit . 7805 IC is used as power supply having two fixed voltage i.e. 3.3v & 5v ,3.3v is required or microcontroller IC LPC 2129 & 5v required to the other circuit. the microcontroller ARM7 LPC 2129 is used at both side i.e. at transmitter & receiver side to transmit & receive the data , which contain built in CAN controller .

IC MPC 2551 is used to convert the voltage level . In the CAN bus there are two level CAN H & CAN L there is no ground level .In the CAN bus ,If CAN H - 2.5v / 3.7v   & CAN L - 2.5v / 3.7v ,CAN H - CAN L =2.5 - 2.5 = 0 v consider as Logic '0' ,If CAN H = 4.1V   & CAN L = 1.5 V ,CAN H - CAN L = 4.1- 1.5 = 2.6   consider as logic '1' . But in another IC consider 3.3v is logic '1' & 0v is logic '0 ' & also required the ground so the IC MCP 2551 is used to convert general level voltage to the CAN   level voltage .

LCD is used to display the value. CAN Bus is used to transmit & receive the data which is explain later.

ARM7 - LPC 2129

ARM7 is a32 - bit microcontroller which provides high performance & low power consumption . The ARM7 LPC 2129 is based on Reduction Instruction Set Computer (RISC) principle . The Instruction set & decode mechanism of the ARM7 is simpler than the micro programmed complex instruction set . so the reduced in the instruction set the instruction throughput is high & impressive real tie response . It has small size & less cost processor core .

The pipeline technique are employed in this ARM so that all the processor & memory system an be operated simultaneously . In the typical microcontroller one instruction is being executed , second is being decoded & third instruction is being fetched from memory .

The ARM 7 processor also employ the unique architecture strategy know as THUMB . The key idea behind this THUMB strategy is the super reduced instruction set . It is used in high volume application .

In the ARM 7 there are two instruction sets ,
1) Standard 32-bit instruction set
2) 16-bit THUMB instruction set
16-bit THUMB instruction set having twice density than standard 32-bit instruction set .

Combustible Gas Sensor – Analog Out (MQ6 LPG)

MQ6-LPG is a gas sensor & is used to detect the gas leakage . It is mostly used to detecting LPG, iso-butane , propane , LNG combustile gases . The sensor does not trigger to the other noises like alcohol, cooking fumes & cigarette smoke or any other noises . This is mostly design to allow microcontroller to determine when present gas level has been reached .

LM35 Precision Centigrade Temperature Sensors

LM 35 series are temperature sensor ,whose output voltage is linearly proportional to the temperature in (celcius) . LM 35 ,user is not require to subtract a large constant voltage from it's output to obtain convenient scaling .This is the advantage of LM 35 series over linear temperature sensor calibrated in Kelvin . To provide proper accuracy LM35 does not require any external calibration or trimming circuit . LM 35 has low output impedance , linear output & precise inherent calibration . It can be operated on both power supply i.e. single power supply or with plus & minus supplies .

Humidity Sensor Module SY-HS-220

The humidity sensor are used to measure the amount of water present in the air . The SY-HS 220 module is used to measure humidity & convert the relative humidity to the output voltage.

3. CONCLUSION

This paper describes about implementing the CAN Bus in vehicle using microcontroller ARM7 (LPC 2129) & voltage converter IC MCP 2551which convert the voltage level .We can show here four parameter of vehicle by using CAN Bus like temperature ,humidity, gas detection & wiper rotation.
This research proposes the design of implement o the CAN Bus in the vehicle to improve the data transformation speed between Electronics control devices   , LPC 2129 which contain inbuilt CAN controller . MQ6-LPG is a gas sensor & is used to detect the gas leakage . It is mostly used to detecting LPG , iso-butane , propane , LNG combustible gases . The sensor does not trigger to the other noises like alcohol ,cooking fumes & cigarette smoke or any other noises . SY-HS 220 is a humidity sensor & used to measure the amount of water molecule present in the air . this sensor then convert humidity into output voltage . The LM35 series are temperature sensors, whose output voltage is linearly proportional to the temperature . this temperature sensor is not require to subtract a large constant voltage from it's output to obtain convenient scaling.   The most commonly used Character based LCDs are based to display the output .

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