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STUDY AND ANALYSIS OF METHODOLOGIES FOR PIC IMPLEMENTATION WITH CAN PROTOCOL

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ABSTRACT-*The PIC processor has been accepted for wide applications with add-on circuits for variety of applications. In this paper communication base application viz Controlled Area Network CAN has been comparatively analysed. There are various ways of implementation of PIC processor with CAN Protocol. In this insight methodology of PIC implementation have been discussed which are contributed by various Researchers. The results of researcher are compared which can be useful for implementation of optimized PIC along with CAN Protocol.*

Keywords- PIC design, CAN Protocol, methodology for CAN implementation.

1. INTRODUCTION

PIC is a family of Harvard architecture microcontrollers made by Microchip Technology to control peripheral devices [1]. While doing analogy with human being, the brain is the main CPU and PIC is equivalent to the autonomic nervous system. When operated at its maximum clock rate a PIC executes most of its instructions in 0.2 microseconds or 5 instructions/microseconds. The PIC microcontroller has inbuilt modules like ADC, CAN that increases versatility of microcontroller. Linear program memory addressing up to 2Mbytes, Linear data memory addressing up to 4 Kbytes, high current sink /source 25mA/ 25mA, up-to 10MIPS operations, DC-40 MHz clock input, PLL active,8x8 single-cycle Hardware Multiplier, Low power high speed Enhanced Flash technology, wide operating voltage range (2.0V to 5.5V), Industrial and extended temperature ranges [3].

CAN is a serial communication protocol which efficiently supports distributed real time control with very high level of security. The domain of application ranges from high speed networks to low cost multiplex wiring. In automotive electronics, engine control units, sensors, anti-skid systems, etc are connected using CAN with bit rates up to 1Mbps. At the same time it is cost effective to build into vehicle body [1] electronics, e.g. lamp clusters electric windows etc, to replace the wiring harness by using CAN. The intension of this specification is to achieve compatibility between any two CAN implementations. Compatibility however, has different aspects regarding e.g. electrical features and the interpretation of data to be transferred. CAN is basically designed for industrial networking but, now-a-days it is widely used in automation, mobile machines, military and other harsh environment monitoring applications.

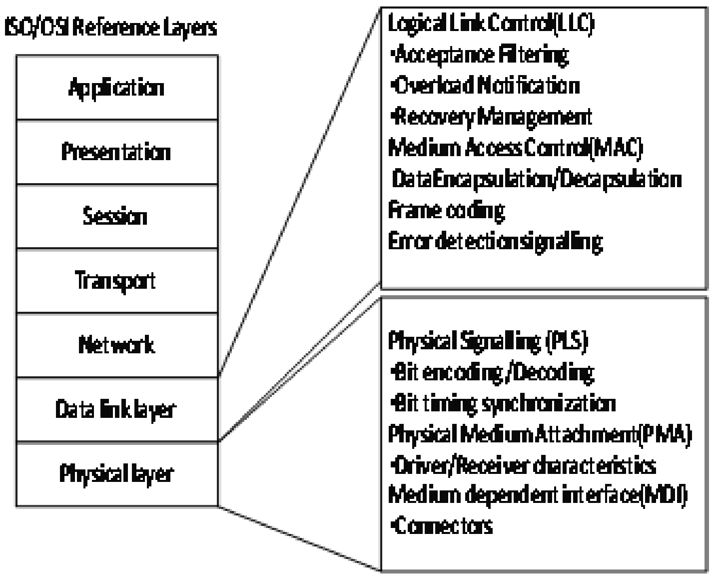

Figure 1: ISO/OSI Reference model of CAN BUS

CAN controller implements only three layers of the ISO/OSI Reference model [4]. It creates bridge from data link layer to application layer as shown in Figure 1. in order to limit the resources and improve the performance. The other layers i.e. Layers 3 to Layers 6 are implemented in higher layer protocols like CAN open, J1939 and DeviceNet. The physical layer and data link layer are integrated on the CAN controller chips and the library functions from the manufactures define the connection between the layers. The application layer deals with the design of the CAN bus for different type of applications.

1.1 Advantages of the System:

Less time delays

Quick response time

Fully automate system
Robust system
Low power requirement

2. CONTRIBUTION BY THE PREVIOUS RESEARCHERS

Here different papers are studied and analysed based on the approaches used by the different researchers and modifications are made to provide more reliability in the proposed system.

Mohan raj M , Rani Thottungal and et al[1], invented application of processor with CAN protocol as monitoring and fault diagnosis in wind turbine.”

Approach used here is that the Electrical energy can be produced using fossil fuels & also by natural resources. It describes the monitoring and fault diagnosis system for the wind turbine using CAN interface. The different sensors are used for monitoring the parameters speed, temperature, vibration, power, and voltage, current to analyse the data received with given interval from the sensor. Fault identification is done using the MATLAB and parameters are measured through CAN interface module and resulting analysis is done using neural network.

Fan Chao, Zhang De-xian, Fu Hong-Liang, Liang Yi-tao found the application as measurement of node parameters for the grain quantity monitoring system based on CAN bus.

Approach used here is realize the data transmitting reliability & real time, the design proposal of CAN bus by using AT89C51&SJA1000, Pressure sensors are mounted on ground and the wall of the barn in some regularity, measurement of errors is not more than 3% under the conspicuous level (0.05). The pressure sensors are cross mounted on ground and linearly even mounted on the wall firstly then wheat is allowed to put into barn gradually and pressure is measured by the sensors [2].

Presi T.P has briefly introduced how effectively CAN be used in the automation field.

Different Parameters are measured using this system can be useful for implementation with two, four, eight, nodes. In this is cost analysis and response time analysis are the major issues of concerned for any given application

Going through the literatures for the contribution as the application using CAN a modified block diagram and its impact on system implementation can be analyzed.

3. Modifications as Suggested by the authors

Figure 2 shows the networks with CAN is simplified and the network without CAN was very complex which is difficult to understand before and it was not possible to recognise the problem in any various part, also it is difficult to correct the specific problem. CAN make it easy and avoid complex structure giving more reliability

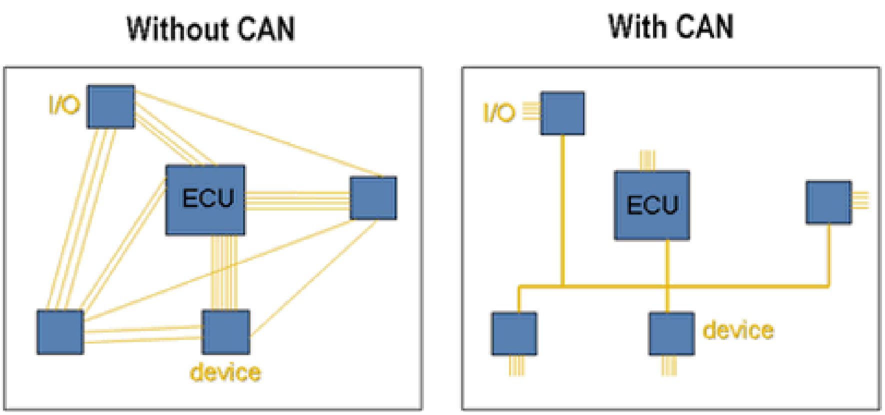

Figure 2: CAN networks significantly reduce wiring.

As shown in Figure 3 MCU and CAN are implemented in such a way that no command can take substantial time for execution. These commands will be carries on the line or wireless communication depending on the transceivers capability. The number of node depends on the set of equipment’s and area of coverage.

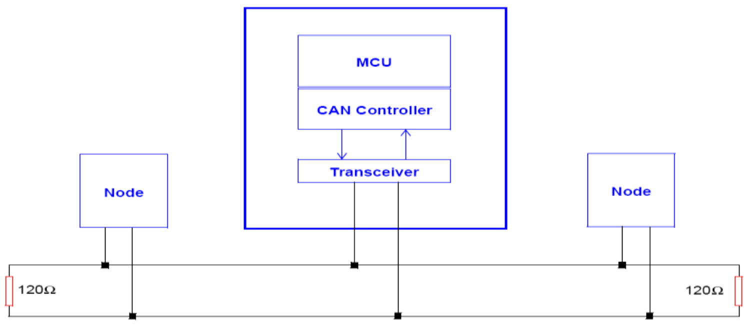

Figure 3:CAN along with PIC Microcontroller

The PIC is chosen because of the low pin count and powerful feature set, which includes an internal oscillator, on-board, multi-channel, 8-bit analog-to-digital converter (ADC), multiple interrupt sources and low power sleep mode.

The second is for the CAN interface comprised of the MCP2510 CAN controller and the MCP2551 transceiver. The MCP2510 provides a full CAN 2.0 implementation with message filtering, which relieves the host microcontroller from having to perform any CAN bus related overhead. It also provides a buffer between the CAN controller and the high-voltage spikes that can be generated on the CAN bus (Figure3) by outside sources. The main features are it supports 1 Mb/s operation. It is suitable for 12V and 24V systems. It is a low current standby operation. There is protection against damage due to short circuit conditions (positive or negative battery voltage). Also there is protection against high-voltage transients. Up to 112 nodes can be connected.

Thus this system will definitely work for implementing various application of CAN with PIC processor and gives more reliable results.

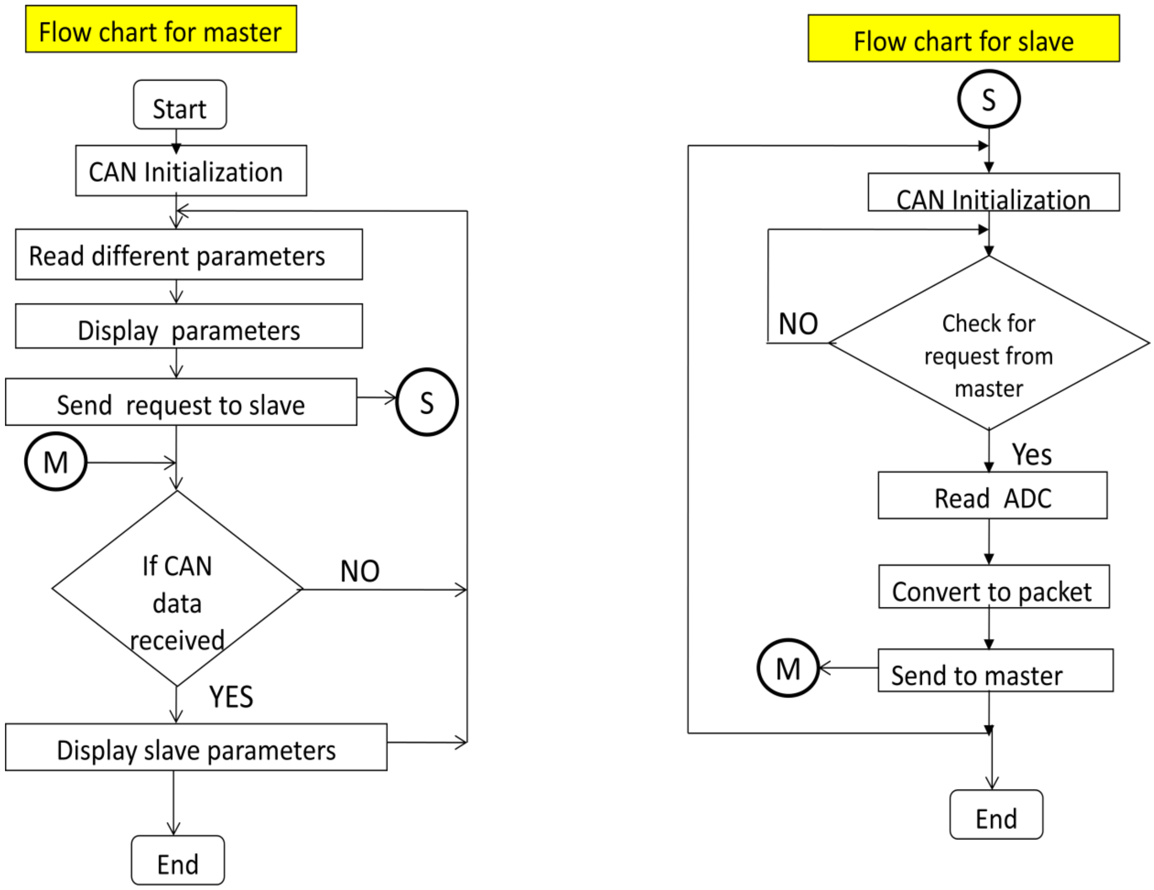

Figure 4: Flow chart for Master- Slave for the PIC based implementation of CAN

Master

In the Master-Slave configuration the Master on initialization read the status and displays it for programming along with the status of Slaves.

This can be worked out in two ways either by polled or basis of priorities.

Once CAN is initialized it will read all the different parameters like temperature, oil level, vibration etc. and it will display the parameters value.

Again it will send request for the slave for any parameter. Then condition is checked for is CAN data received then it will display the slave parameters.

Slave

After CAN initialization it will check for the request from the master, it will read ADC, again it will convert it into packet and given to the master side and handover the control to the master and then it will display the parameters.

The comparative Table 1 shows the various parameters reading by using CAN implementation

Table 1: Comparative table for the system

Sr. No.	Parameters	Minimum	Maximum	Application
1	Supply Voltage V	4.5	5.5	Networking home terminal
2	Transmission Speed MBD	1	-	Fast response in various fields like automation, military etc.
3	CANH,CANL I/O voltage, V	-36	+36	Automotive and mid-heavy truck applications.
4	Bus Voltage, V	1.5	3.0	Transceivers and heterogeneous networks.
5	Propogation Delay, nS	-	50	Maximum delay ensures desired data rates and bus length in an isolated CAN nodes
6	Ambient Temperature ºC	-40	+125	Fuel pumps, engine motor, electric braking

4. CONCLUSIONS AND FUTURE WORK

Since this is a review paper **the** main objective of this paper was to study various methods for PIC implementation with CAN Protocol. The author has also suggested a Master Slave configuration using CAN-protocol. At last comparison for measurement of various parameters has been tabulated for various applications. The properly designed and effective implementation of CAN protocol various applications will definitely fulfil the requirement. Thus CAN protocol is finding various applications because of its quality and reliability.

A smart CAN node can be implemented with low cost, low pin count devices, such as the PIC microcontroller and MCP2510 Stand-Alone CAN controller, providing a very flexible and effective solution for a variety of applications.

5. REFERENCES:

1] Presi T.P.“Design and development of PIC microcontroller based vehicle monitoring system using CAN Protocol”, IEEE International Conference PP. June 2013.

2]Wilfried voss ,”A comprehensive guide to controller Area Network”, Copperhill Media Corporation,2005-2008.

3] Microchip Technology Inc.DS41159E:PIC18XX8 Data Sheet Pat Rechards ,”A CAN physical layer discussion”, Microchip Technology Inc.DS00228A.

4] International Journal of Research Paper in,” Design of Automatic Automobile using CAN Bus”. IJRCCT, ISSN 2278-5841, Vol 1, Issue 7, December 2012.

5] National semiconductor,”LM35 Precision Centigrade Temperature sensors datasheet”, National semiconductors corporation ,November 2000.

6] Dogan Ibrahim, “Microcontroller based temperature monitoring and control”, ISBN: 0750655569, Elsevier Science & Technology.

7] International journal paper in “GPS and GSM based Vehicle Tracing and Employee Security System”, Volume 62– No.6, January 2013.

8]] Mohanraj M , Thottungal and et al., “A CAN Bus based system for monitoring and fault diagnosis in wind turbine”, IEEE International Conference pp.978-1-4673,April 2013.

[9] Manjunath T K ,Andrews Samraj “Locking and unlocking of theft vehicles using CAN”,IEEE International conference paper,14-15 March 2013.