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Vehicle Control System using Controller Area Network [Can] Protocol

T. Rajasekar[1], K.Bhaskar[2]
[1]Student, M.Tech, Embedded System Technologies,Vel Tech Dr. RR & Dr. SR Technical University
[2]Assistant Professor, Department of EEE,Vel Tech Dr. RR & Dr. SR Technical University
Email:rajasekar.999@gmail.com,bhaskark@veltechuniv.edu.in

Abstract - The paper is an attempt to analyze Vehicle Control System implementation using CAN Protocol. In this paper we have given an effective way to increase the vehicle safety. The ARM based data acquisition system that uses ADC to bring all control data from analog to digital format. The communication module is embedded networking by CAN which has efficient data transfer rate up to 1Mbps. The CAN Protocol it was necessary for the different control systems (and their sensors) to exchange information between ECU. This was usually done by discrete interconnection of the different systems (i.e. point to point wiring). The requirement for information exchange has then grown to such an extent that a cable network with a length of up to several miles and many connectors was required.

Keywords- ARM (Advanced RISC Machine), CAN (Controller Area Network), ADC (Analog to Digital Convertor), ECU (Engine Control Unit)

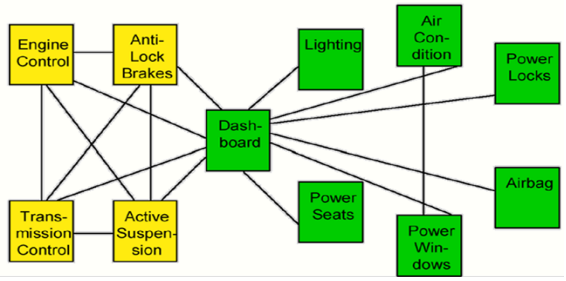
I. INTRODUCTION

Generally a vehicle was built with an analog driver-vehicle interface for indicating various vehicle statuses like speed, fuel level, Engine temperature etc. The benefits of CAN is effectively implemented in vehicle it is used for achieving automation, over other tradition schemes it will offer increase flexibility and expandability for future technology. The CAN is provide a high speed and the capacity is high it is capable for handling a large number of parameter with more efficiently .The parameters like temperature, if the temperature increase above the $600^{O}C$, the automatically cooling system apply due to this temperature is not exceed, speed measure using RPM sensor if revolution increase up to 70 per minute controller act and to avoid the maximum revolution and to check the fuel level continuously and display in the percentage if fuel level below 20 percent the controller gives buzzer to the driver and fuel level and temperature continuously display on the LCD.

II. NEED OF CAN

- Numerous CAN products and tools on the object
- Hardware implementation of the protocol
- CAN Bus used for the combination of error handling and fault confinement with high transmission speed(up to 1Mbps)
- Simple transmission medium
- Twisted pair of is the standard, but also just one wire will work
- Other links works, too: Opto – or radio links
- Excellent error handling
- Fault confinement
- High speed, real time communication
- Provide noise immunity in an electrically noisy environment

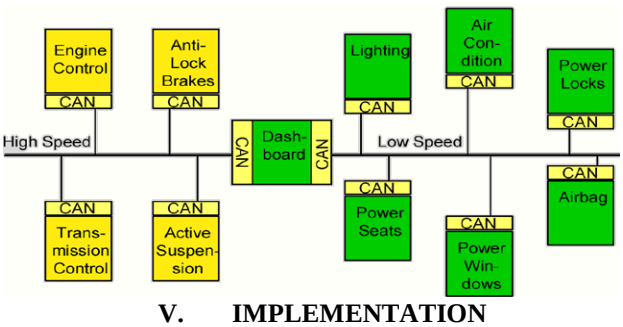
III. EXISTING SYSTEM



The block diagram of existing system has all the engine control units [ECU] like anti – lock brakes, transmission control, suspension and engine temperature … are interconnected with each other. But the wiring between the units is more complex. The real time data analysis is quite a tedious process, as a result it leads to a catastrophe. Due to complex wiring system the bit rate is very low and the communications between the nodes are not much efficient. All the ECU's are monitored by a single microcontroller so that the flow of data in the system is not as fast as to process the real time data. Apart from the important vehicle control parameters the other parameters like air-conditioner, windows, front and rear vehicle monitoring system are also be included. But the number of ECU's to be connected with the microcontroller is limited.

IV. PROPOSED SYSTEM

In the proposed system wiring between the units is as simple as in CAN protocol network only two lines are used for data communication between the nodes. In CAN protocol the two lines are data line and another one is power line. The real time data analysis is quite an easy process. Due to simple wiring system the data rate is high up to 1Mbps. All the ECU's are monitored by a Master CAN controller and Slave microcontrollers so that the processing of data in the system is as fast as to process the real time data.



V. IMPLEMENTATION

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The hardware structure mainly integrates the CAN bus controller, ARM LPC1768 as the main control module, Speed sensor, temperature sensor, ultrasonic sensor(obstacle detecting sensor),level sensor, LCD display to provide Digital interface and other accessories .Block diagram of CAN vehicle control system. It consists of one master node and two slave nodes .ARM as the master controller (Engine Control Module) which controls the vehicle status with various sensors. Two PIC ICs are used as slave nodes to receive the inputs of vehicle status. The communication between these sensors is done by using CAN controller. Slave controller receives the signals from vehicles like speed, temperature, fuel level, and ultrasonic obstacles detector etc., send to master controller with high speed rate. Master controls the status of vehicle and sends the feedback to operator panel by providing digital information's via LCD display and alarms. Here Operator interface is digital type. By this operator can easily see the signals and able to control the vehicle. Ultrasonic obstacle sensor helps in identifying the obstacles presence around the vehicle.

VI. CONCLUSION

The main goal of this paper is to show development of digital car system. Parameters of vehicle like Fuel level indication, Temperature of engine and speed of car are displayed on LCD digitally and also controlled. The proposed high-speed CAN bus system solves the problem of automotive system applications. In this project only the most important vehicle control parameters are monitored and processed, whereas in future all the other parameters like GPS tracking data, windows, seat adjustment, music system and so on are all monitored and controlled digitally using this prototype. Instead of using multiple wires we used only two wired CAN protocol. Requirement of wires and also complexity reduced. Avoid accidents by monitoring different parameters as like distance or intensity of light and temperature. We would also like to thank to the other faculty & laboratory staff of college who helped us understanding the courses and laboratory work.

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