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Real time implementation of anti-lock breaking system for vehicle fault measuring and controlling using can protocol

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Abstract- Controller Area Network is a high level communication with good stability and reliability protocol. CAN is invented by ROBERT BOSCH. It is used to analysing and controlling the various digital data inside an automobile industry. CAN protocol mainly preferred for vehicle communication. This project is implementing to monitoring and controlling the vehicle communication with the controller of ATMEGA. It is used to monitoring and controlling the engine control unit (ECU), Antilock breaking system (ABS), and also temperature measuring, CO_2 is measuring. The simulation of the project has been implemented using MATLAB with the help of Embedded C.

Keywords- controller area network (CAN) protocol, battery voltage, CO_2 level, Antilock braking system(ABS), MAT LABB, ORCAD, ATMEGA microcontroller.

1. Introduction

The Control Area Network is a high stability and reliability protocol in automobile industry. CAN is specially made for the vehicle digital data parameters monitoring and controlling. It is less cost when compared to other protocol, also less circuit complex, and reduce the more wiring in the vehicle communication system. CAN is a priority depending message scheduling protocol. It also has utilized efficient bandwidth, flexibility, and simple overhead.CAN protocol depending on the serial communication system.CAN run with the two modes of operation CAN HIGH and CAN LOW. In now a day's CAN protocol

is used as a standard protocol for all automobile industry.CAN run in networking mode of operations in vehicle data monitoring system. CAN is providing a efficient communication and stability protocol. If it work between the sensors, controllers, actuators, ECU, and Antilock breaking system. The CAN work in Bus mode. bus has a multi master module and multi slave module structure. Where each device on the bus system sends or receives a date. But only one device can send data at any time while all other system has been listen or receive the data and obey master module commands. If two or more device attempt to send data at the same time which one is highest priority is allowed to send its data while other system waiting in queue, or return to device mode.

2. Hardware description

This proper describing the process of vehicle data monitoring and controlling using CAN protocol with the help of ATMEGA microcontroller. In our paper describing the 3 major part of the process, like

1. Antilock breaking system (ABS).
2. Engine Control Unit (ECU).
3. CAN serial wiring control system and switch block.

in this three modes of operation has been done with the process of vehicle data measuring and controlling using CAN protocol communication inside the vehicle or any automobile industries.

2.1. Antilock Breaking System (ABS)

Antilock breaking system is very important for a real time vehicle control. CAN is flexible for controlling the ABS vehicle with the help of ATMEGA microcontroller.

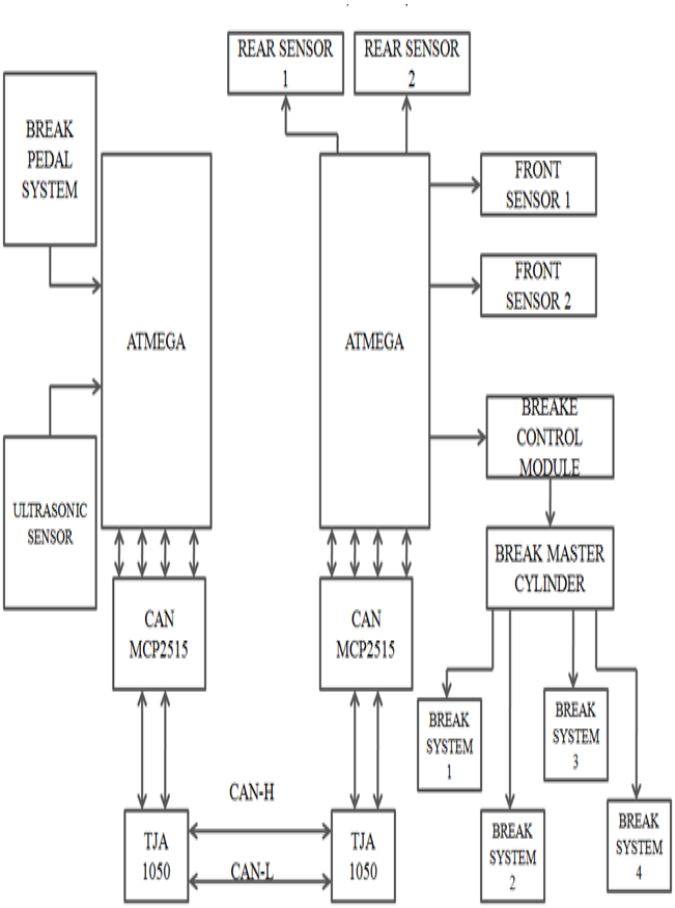

Fig.1. block diagram of Antilock breaking system

In antilock breaking system block diagram has been shown in above. In this ABS have a four major parts has been available. That all the four parts has been linked with CAN protocol with the help of ATMEGA microcontroller. If it is an efficient method to reduce the speed while we are driving over speed.

There are

1. Ultrasonic sensors
2. Break pedal system
3. Break control module
4. Break master cylinder

In ABS system totally controlled by the ATMEGA microcontroller. Ultrasonic sensors are used for the measuring of the distance. It is used to measure the front

near able vehicle while we are driving. If any vehicle closely near in front that the ABS has been activated and speed will automatically reduced. ABS is used to avoiding the skidding of vehicle. Break pedal system has been used for the break applying the tyre. And break control module linked with the break master cylinder mode and CAN protocol link. In both break control module response based on the CAN signal. If it get CAN HIGH the ABS break has been activated and it t denoting CAN LOW signal from controller ABS not working. In ABS system four sensors are connected like front tyre sensors and rear tyre sensors. The ABS module has been set the priority range of 2mb/s of responsible time.

2.2. Engine Control Unit (ECU)

In every vehicle need to monitoring and maintaining the engine system that is called engine control unit (ECU). It having using LM35 temperature sensor, fuel sensor, air pressure, voltage and speed sensor. That all are data has to be controlled by using the MCP2515 CAN transceiver. that also following the procedure of the two modes like CAN high and CAN low signalling mode.

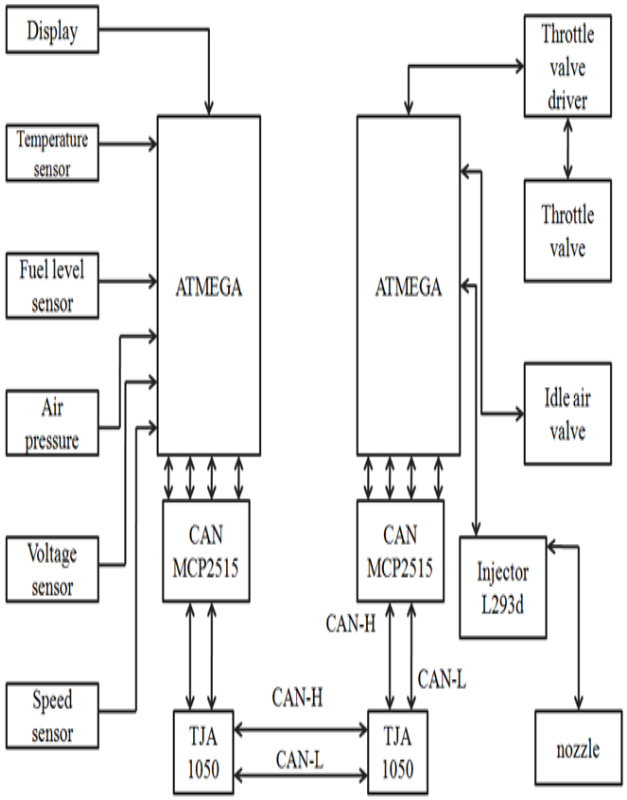

Fig.2. Block diagram of Engine Control Unit (ECU)

In engine control unit mainly connected for the throttle valve and we want to activate the throttle valve with the help of throttle valve driver. Idle air valve injector also available for maintaining the each and every parts of the engine control unit. Here we are using the module of injector L293d and also have some nozzle for air inlet and outlet performance for cooling system. In that engine overall performance of each and every movement has been monitoring and as well as controlled by the CAN protocol with help of ATMEGA microcontroller. That the engine control unit (ECU) has been used for the priority range of 1mb/s. It is denoted as the response of the CAN transceiver signal.

2.3. CAN Serial Wiring And Control Switch Block

In vehicle combination of both wireless and wired connection. The ABS and ECU are controlled and maintained by the digital sensors that means wireless connection. But some other outer parts are connected through the wired connection that are all also controlled and maintained by the CAN protocol.

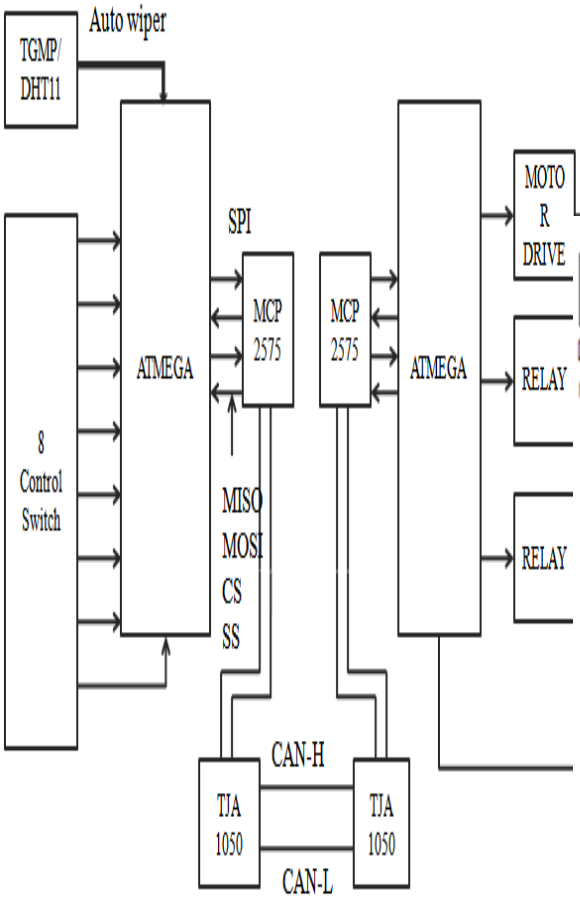

Fig.3. CAN serial wired connection

In this wired connection have wiper, light and AC fan, and LCD display. That wiper working depending on the motor driver. It having and 4 or 8 control switch to control the wired connection parts. Here humidity sensor like DHT11 has been assigned for measuring rain. Incase rain drops fall, the DHT11 sensor has been activated and give the CAN HIGH signal. Then wiper automatically started. That this wired connection system has been working with the priority range of 125kb/s. It also working with the control of ATMEGA controller. These all measuring data are controlled by the use of CAN protocol as well as ATMEGA microcontroller.

3. MATLAB SIMULATION BLOCK

In this paper has been simulated with the help of MATLAB simulation. Using Embedded C to write the program to simulating how the ABS will work. How the CAN transceiver has been response based on the priority range.

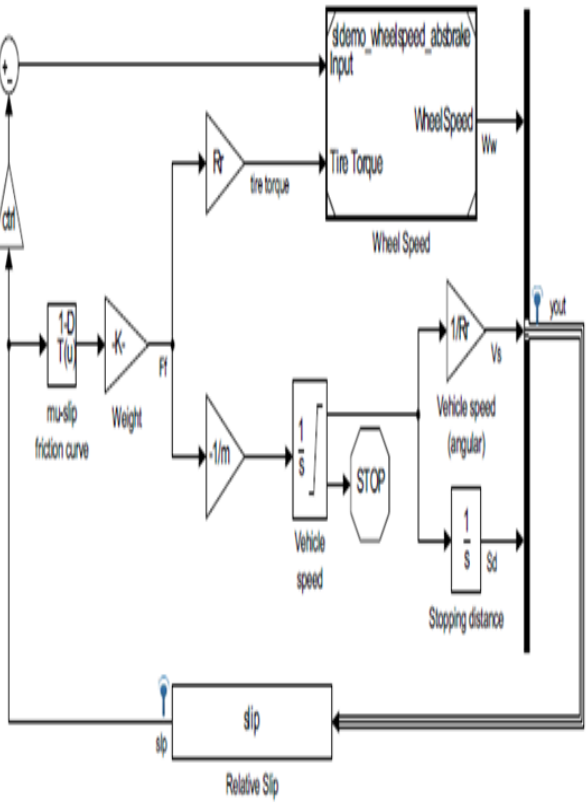

Fig.4. MATLAB Simulation block

Here the simulation blocks has been draw for executing and testing the response of ABS in the CAN protocol. In this system have 2.0 desired relative slip mode and

compared with the actual speed by using the comparator in CAN transceiver system. Without ABS the slip will be occurring. The slip will generated the tyre getting sudden break the vehicle getting skidding and its goes to accident. That why we are using ABS to avoid this skidding and recover from the Accident. That the speed control of without ABS and with ABS has been following below with the help of graph.

4. Results and Graph

In that the paper used to simulating the antilock breaking system. Simulation graph of with antilock breaking system and without ABS system. In this paper simulation output had verified and as well as real time implementation process also successfully output verified. The difference diagram shown in below.

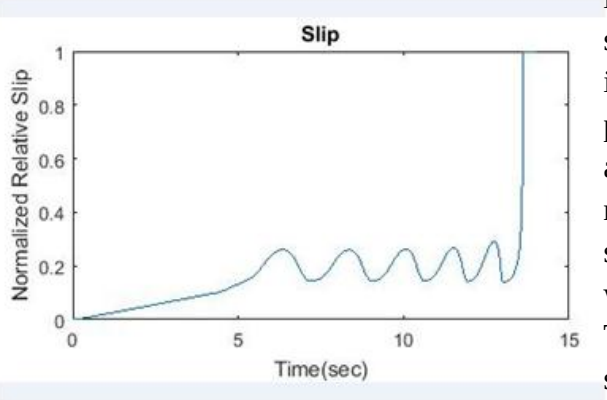

Fig.5. without ABS system

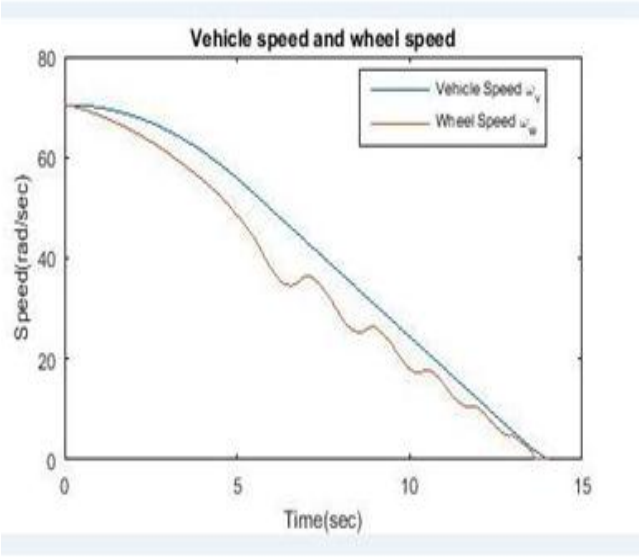

Fig.6. ABS vehicle speed system

This two plots denotes the without ABS speed control and with ABS speed control has been mentioned. Using CAN protocol we getting the high reliability and stability function of vehicle data analysing and controlling the system.

5. CONCLUSION

in this we have used in multi node control system. It has high response. In this paper increasing the response with the help of CAN protocol as well as ATMEGA controller. And also implementing the priority range of response in multi node system. We have simulated the variation of with ABS and without module in vehicle speed analysing. That the simulation difference plot has been show in fig 5 and fig 6. In this system we have assigning the quick response to display and control the actual value of data in real time. Cost analysis done. Simulating output also verified with use of MATLABB and Hardware implementation also verified with economical range. In this project has been implementing in real time with economical cost

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