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Implementation of CAN BUs in designing of smart vehicle control system using ARM7 Microprocessor

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ABSTRACT

The reliable and high speed data communication between the sensing devices and actuating devices through a controller is the real time requirement in an automobile. The higher the speed lessens response time in critical situation. The parameter such as ABS, airbags, engine temperature need on time response. Otherwise the whole system may met with severe collapse or some time may threaten life also. To make all the factor be in a system that performs better, the communication between the controller with sensing and actuating devices should be with in a frame of high speed communication. The CAN bus is highly reliable and provides high speed communication between control input and resultant output. The earlier generation of CAN is a point to point communication that was using more number of wire. As a result, wired load lags the system speed. This is a major issue when threat is so critical. To overcome all these drawbacks CAN was introduced that reduces the load on system. CAN offers higher flexibility and expandability. The integration of CAN bus with automobile industry is new perception that created a proper link in controlling devices. The factors such as headlight, engine, wiper, door lock, car speed and location tracking are analyzed and taken a valid action against them. The director of the project is Advanced RISC Machine (ARM) 7 LPC2129 microprocessor. In CAN bus the communication arisen with the help of CAN Transceiver. The CAN transceiver is responsible for the CAN communication. The MASTER and SLAVE is controlled by CAN controller. The CAN communication enhances the flexibility, performance and security of the system.

Keywords: *ARM7 Microprocessor, CAN Bus*

1. INTRODUCTION

The increased population in metropolitan cities makes them use their own vehicle to travel from one place to another place. So as the number of vehicle increased, the traffic problem will arise. Traffic induced air pollution is one of the key factors contributing to different illnesses in most of the cities. One of the strategies proposed to reduce vehicle emissions is by driving less. Therefore different techniques are being researched in order to lower the driving time, but also carbon emissions. In order to decrease the driving time, one of the researched techniques that of the software updating of Electronic Control Unit (ECU). ECUs in a vehicle take responsibility of each and every parameter that is related to vehicle. Different parameters such as head light control, wiper control, engine temperature, speed control, tire pressure are continuously monitor by the ECUs. In modern car there are up to 70 ECU's taking control of different parameters. All these parameters should be monitor at same time that puts lot of load to the ECU and the entire system in result may stop working. To avoid this data collision a communication protocol called CAN has been implemented. The CAN protocol is a bus that communicates with different module on the basis of priority. CAN is message oriented protocol where the various devices inter connected with very less number of wire. So CAN bus helps to reduce the wiring load of an ECU and provides higher speed to the communication.

2. CAN BUS

Bosch initially established the CAN in 1985. Before that electronic devices in vehicle were using point-to-point wiring systems. Then again there was a need of more number of devices that resulted in bulky wiring made the system expensive. So there was a need of dedicated system to handle the proper communication between the devices. Then CAN, a high-integrity serial bus system for networking intelligent devices, emerged as the standard in-vehicle network. The advantage of using CAN is low cost, light weight, broadcast communication, error capability, and priority.

3. ARM 7 LPC2129 MICROPROCESSOR

The LPC2129 are based on a 16/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, together with 64/128/256 KB of embedded high-speed flash memory. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. The alternative 16-bit Thumb mode reduces code by more than 30 % with

minimal performance penalty. With their compact 64-pin package, low power consumption, various 32-bit timers, 4-channel 10-bit ADC, two advanced CAN channels, PWM channels and 46 fast GPIO lines with up to nine external interrupt pins these microcontrollers are particularly suitable for automotive and industrial control applications, as well as medical system and fault-tolerant maintenance buses. With a wide range of additional serial communications interfaces, they are also suited for communication gateways and protocol converters as well as many other general- purpose applications. The major part of the LPC2129 is it has a CAN channel for high speed data communication.

4. PROPOSED SYSTEM

The system is supposed to design with factors wiper, headlight, engine temperature, GPS, fuel level, speed control, tire pressure. Since the research is on the way of expected outcome, the only factors that the system come up with the result are head light, wiper, engine temperature, speed, tire pressure. The result of each device will be described below with suitable outcomes. The Figure 1 shows the vehicle control system using CAN. An set of sensors used to receive the data and CAN bus will communicate these data with main controller LPC2129. After that the action for each sensor will be initiated by the controller.

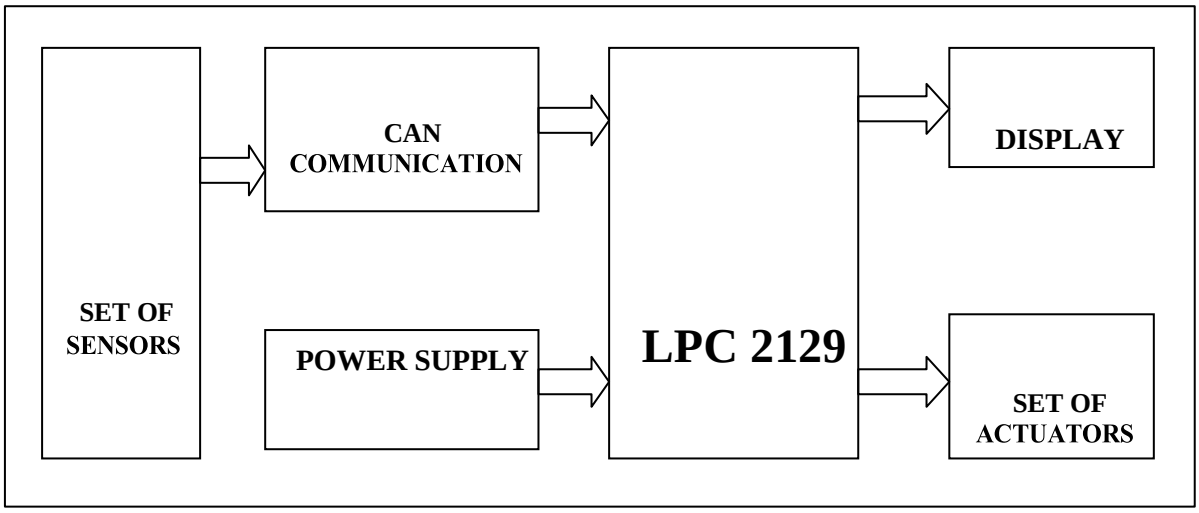

Fig. 1: Block diagram for Vehicle control system using CAN

4.1 Head light Control

The darkness level indication for headlight is shown in Figure 2. The light depending resistor sensor (LDR) is used to indicate the darkness level. If the brightness level is less than the required range then status in display is LESS LIGHT. In this the light brightness level is less than 100 lux (I.e. 56 lux), the controller will sense the input from LDR sensor and check for brightness. Immediately it notices that brightness level is less. After that the headlight will turn ON. If the light level more than 100 lux then control senses that there is enough light and keep headlight OFF state.

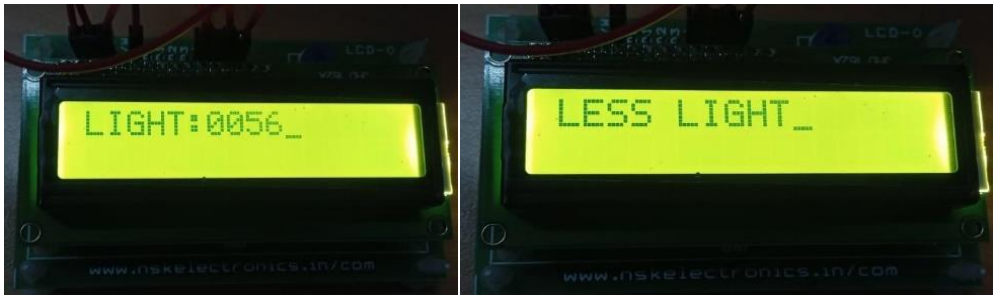

Fig. 2: Darkness level monitor for headlight operation

4.2 Wiper Control

The wiper control in vehicle condition is shown in Figure 3. If there is no rain, the wiper should be at OFF state. If there is rain the wiper at ON state so that rain will be wiped away. The rain sensor monitors the water droplets on the plate and take the necessary action as a wiper ON or OFF.

Fig. 3: Wiper control system in rain condition and no rain condition

4.3 Temperature Control

The Figure 4 shows the engine temperature level in normal condition. The LM35 sensor is used to monitor an engine temperature. The Fig. 3.3 shows that the engine temperature is 21º Celsius and since it is below 50º Celsius, the display will show that engine temperature is normal. LM35 temperature sensor will display the engine temperature status.

Fig. 4: Engine temperature level in normal condition

The Figure 5 shows the engine temperature level in critical condition. From this it is analyzed that engine temperature is more that 50º Celsius (i.e. 168º Celsius) and shows more temperature message in display. In this condition the controller will be asked to take required action to reduce an engine temperature. The LPC2129 communicate with sensor with the help of CAN communication those results in high speed of sensor data to the main controller. The CAN communication takes the help of inbuilt MCP2551 transceiver from sensor to controller.

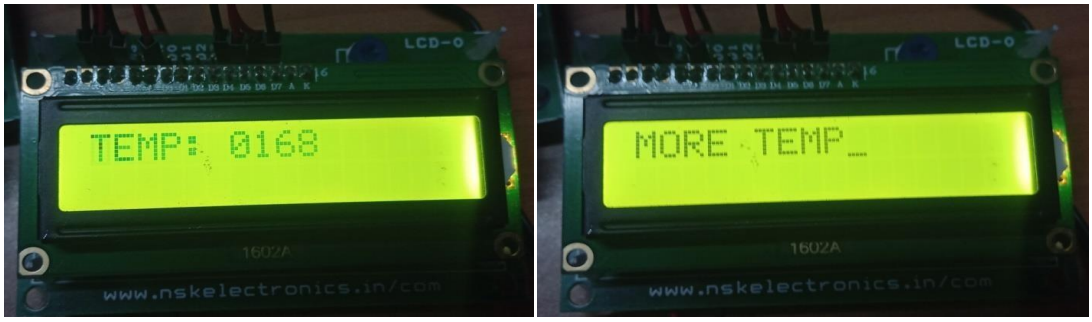

Fig. 5: Engine temperature level in critical condition

4.4 Vehicle Speed Control

The Figure 6 shows the result window of ultrasonic program compiler. The result window shows that the target has been built and hex file is created for the program. Finally the compiler concluded that there is no error and warning for the speed control of the vehicle.

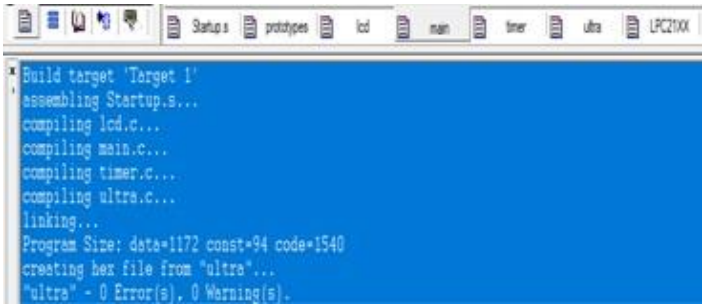

Fig. 6: Compiler Result window for ultrasonic module

The Figure 7 shows the General Purpose Input / Output (GPIO) window after the code is being debugged. This indicates that the GPIO pins of processor are being utilized for the experimental analysis.

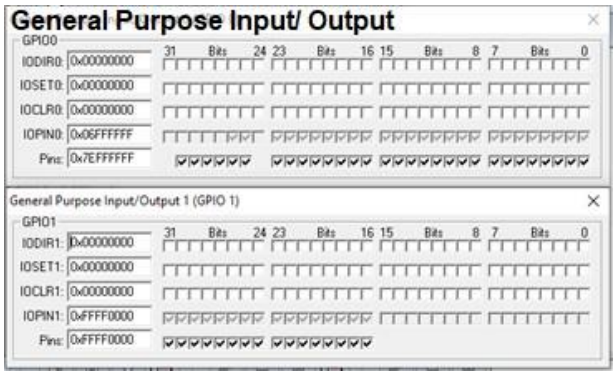

Fig. 7: General Purpose Input / Output (GPIO) for ultrasonic module

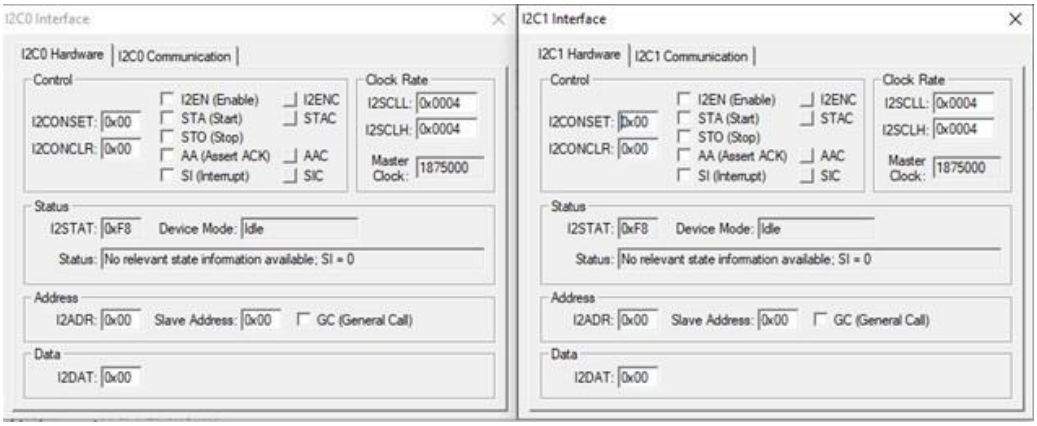

Fig. 8: I2C interface between the system and module for vehicle speed control

Figure 8 presented that the I2C interface between the system and modules that specifies the baud rate for the communication.

The Figure 9 shows the simulation circuit for the vehicle speed control using ultrasonic module. The simulation supposed to be experimented in such a way that the distance between the object make the vehicle to control.

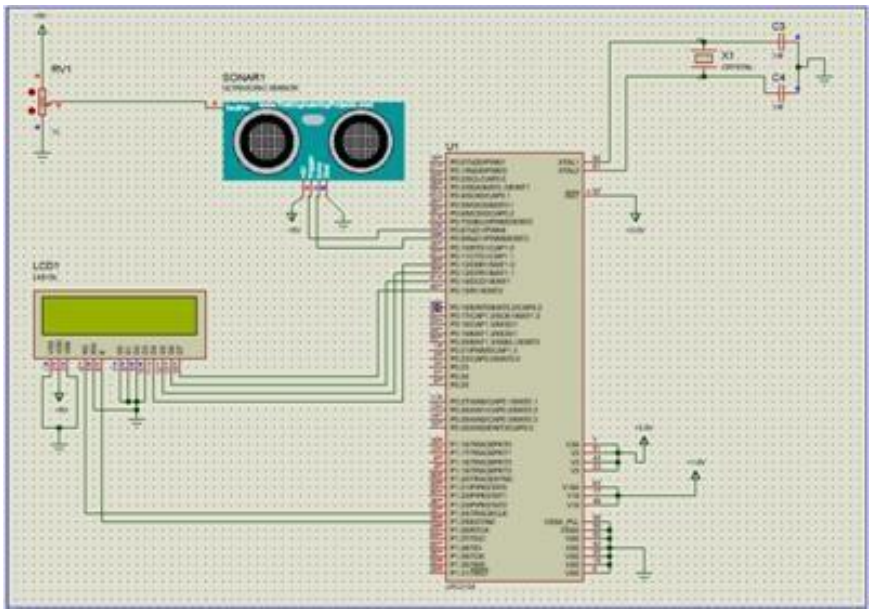

Fig. 9: Proteus simulation for the vehicle speed control

4.5 Tire Pressure Monitoring

The tire pressure monitoring controlled by a pressure module that make processor to tell about the pressure level of the tire. When the pressure level reduced below threshold the sensor indicates that the tire pressure is low. BMP180 Pressure module is used to experiment the parameter. Figure 10 shows the result window of the Keil compiler that shows there is no error and warning in the program used in tire pressure monitoring. It is also shows that the hex file for the same is created after the target is being built.

Fig. 10: Compiler result window for pressure module

The Figure 11 shows the General Purpose Input / Output (GPIO) window after the code for pressure module is being debugged. This indicates that the GPIO pins of processor are being utilized for the experimental analysis.

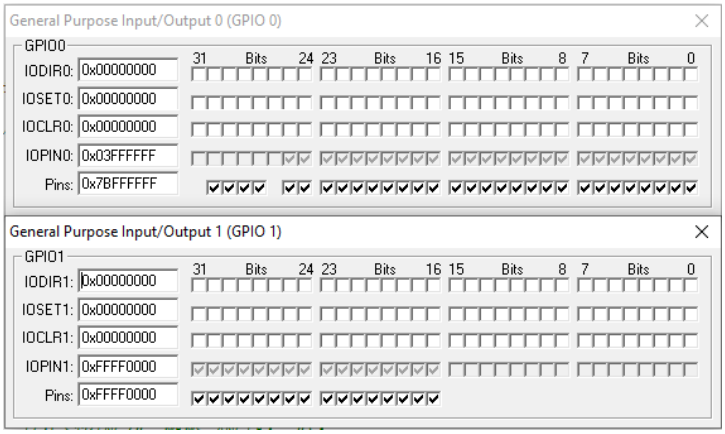

Fig. 11: General Purpose Input / Output (GPIO) for pressure module

Figure 12 presented that the I2C interface between the system and modules for tire pressure monitoring that specifies the baud rate for the communication.

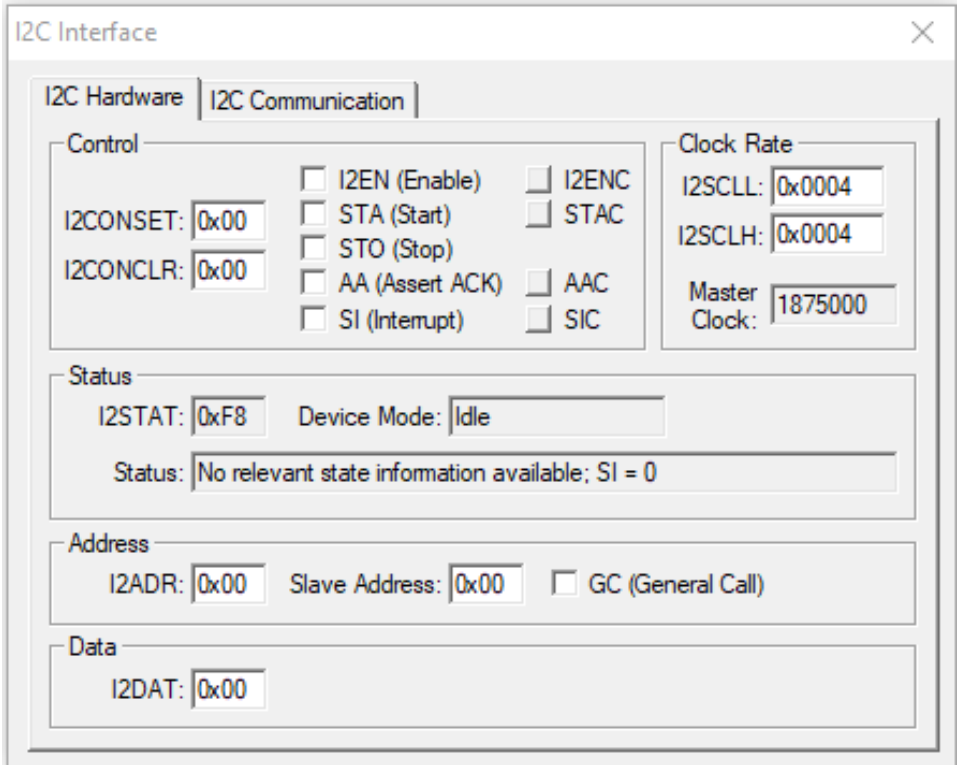

Fig. 12: I2C interface between the system and module for tire pressure monitoring

The Figure 13 shows the simulation circuit for the tire pressure monitoring using pressure module.

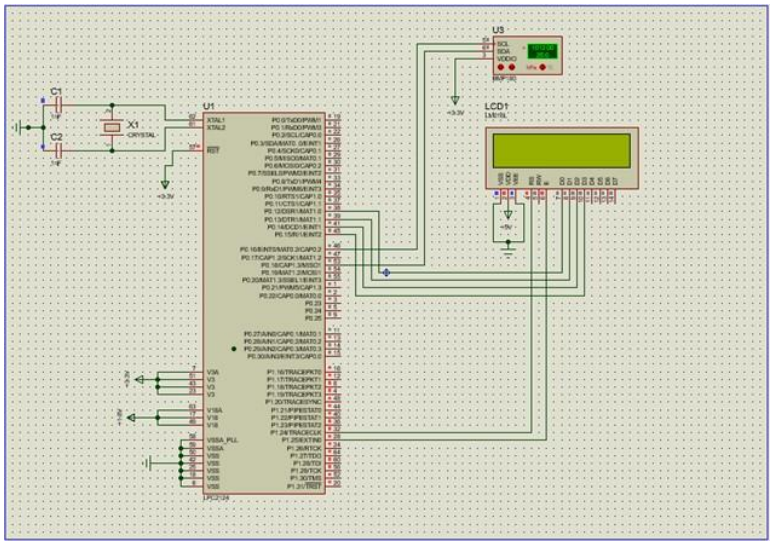

Fig. 13: Proteus simulation for the tire pressure monitoring

5. CONCLUSION

The vehicle speed control is a real time concern where it causes damage to a human life if it does not get controlled on time. The smart design for controlling the vehicle speed could relieves the pressure on driver. The tire pressure monitoring on real time make best use of time since whole weight of the vehicle lies in the tire itself. If the tire pressure is at expected level then there is ease of travel. So it is needed to monitor the tire pressure level in real time as it is a major concern for the travel. The speed of the vehicle and tire pressure monitoring automatic head light control, engine temperature control, and wiper control makes the system will make the system smarter. And work better in future technology.

6. REFERENCES

[1] Vijayalakshmi "Vehicle control system implementation Using CAN protocol" International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering – Vol. 2, Issue 6, June 2013.
[2] Joshi, Kashyap, and Vipul Gohil. "ARM 7 based controller area network for accident avoidance in automobiles", International Journal of Engineering Trends and Technology (IJETT) – Vol. 9, Issue 2, March 2014.
[3] Mahalaxmi R.Chougale, "Can Based Data Display Unit Using Arm", International Journal of Engineering Trends and Technology (IJETT) – Vol. 6, Issue 4, March 2015.
[4] U.Dhawanes, M.S. Kolhe, "Intelligent Car System Using Arm & Can", International Journal of Advanced Research in Computer Engineering & Technology (IJARCET), Vol. 5, Issue 5, May 2016.
[5] B.RamRatnaker Reddy, "CAN based advance security system interface for vehicle using arm7 platform", International Journal of Science, Engineering and Technology Research (IJSETR) . Vol. 5, Issue 4, April 2016.
[6] Judeson Antony, "Vehicle Tracking And Analysis Using Can Protocol And Iot", Int. Journal of Pure and Applied Mathematics, Vol. 120, Issue 6, May 2018.
[7] Khangare Bhushan, "Design of ARM Based Interactive Data Acquisition and Control System for Embedded System", International Journal of Innovative Research in Advanced Engineering (IJIRAE), Vol. 1, Issue 1, March 2014.
[8] Nirubama, "Data acquisition system based on CAN bus and ARM", Middle-East Journal of Scientific Research, Vol. 5, Issue 8, July 2014.
[9] Sharma, Swati. "Review on CAN based Intercommunication between Microcontrollers", Journal of Emerging Technologies and Innovative Research (JETIR), Vol. 2, Issue 1, January 2015.
[10] Patel, "Design and Implementation of ARM Based advanced Industrial Control and Data Acquisition with Wireless LAN Monitoring", Journal of Embedded Systems, Vol. 3, Issue 5, April 2015.
[11] Bengal, "Implementation of Data Acquisition System onto ARM for Intra Underwater System by using Bluetooth", International Journal of Advance Scientific Research And Engineering Trends, Vol. 3, Issue 3, March 2018.
[12] Paturkar, "An ARM 7 based temperature measurement system using CAN bus", IEEE International Conference on Consumer Electronics-China, Vol. 4, Issue 2, April 2014.

