ARM Based Integrated Method for Calculating the Vehicle Parameters by Using CAN Protocol

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ABSTRACT

In this paper Monitoring driving habits of a person is presented, which is based on CAN network. The CAN bus is used as a communication of a distributed control network. This paper mainly introduces the design of the hardware and the software in detail. This device track speed, Engine temperature and Alcohol consumption status. With its unique Dashboard Reporting Tools, Owners not only know answers to where, when, and how fast, but importantly they now have insights as to "how" their driver is driving. Driving behaviors such as excessive braking, quick acceleration, and how those can change between the daytime and nighttime are just some of the key areas analyzed. Dashboard Report provides a quick and easy to understand summary of behavior of each session.

This project is implemented in two sections. First one known runs with ARM as master node and another as normal ARM data acquisition node to which sensors are connected. Communications between two nodes are accomplished through High Speed CAN communication. Sensors connected are temperature, speed, and Alcohol sensors. The master node collects all these information through CAN network and stores in three sessions. To acquire the results, respective session switches are provided at the master node. These results can be monitored on display. A Driver Behavior Reporting System that works by collecting and sending actual, real-time data directly from your driver's car whenever it is being driven. You stay aware and informed, so you can reinforce responsible driving habits, or immediately address areas of concern.

Index Terms- ARM, CAN (Controller Area Network), Embedded C, GSM, Sensors, ECU (Engine Control Unit), OrCAD etc.

1. INTRODUCTION

Advanced in-vehicle information systems provide vehicles with different types and levels of intelligence to assist the driver. This project implemented here tracks speed, Engine temperature and Alcohol consumption status. With its unique Dashboard Reporting Tools, Driving behaviors such as excessive braking, quick acceleration, and how those can change between the daytime and night time are just some of the key areas analyzed. Dashboard Report provides a quick and easy to understand summary of behavior of each session. The introduction into the vehicle design has allowed an almost symbiotic relationship between the driver and vehicle by providing a sophisticated & intelligent driver-vehicle interface through an intelligent information network. This paper discusses the development of such a control framework for the vehicle which is called the digital-driving behavior, which consists of a joint mechanism between the driver and vehicle for perception, decision making and control. This project is aimed at the implementation of CAN protocol[2][6] using ARM for vehicle monitoring system. The main feature of the system includes monitoring of various vehicle parameters such as Temperature, presence of CO level in the exhaust, Fire, Battery Voltage and Alcohol Consumption, identify location, Speed control. This project implements the development of such a control framework for the vehicle which is called the digital-driving behavior[4], which consists of a joint mechanism between the driver and vehicle for perception[5], decision making and control.

2. LITRATURE SURVEY

It was developed by Robert Bosch in 1985 for communication between various digital devices inside an automobile where heavy electrical interferences and mechanical vibrations are present. [10]

In 1991 Specifications of the extended CAN2.0 protocol Part 2.0A 11-bit identifier Part 2.0B –29-bit identifier(extended frameformat)[10].In 1992 CAN in Automation established as the international users and manufacturers Group.

Steve Corrigan, "Introduction to the Controller Area Network",Published by Texas Instruments Application Report, SLOA101A, August 2002 Revised July 2008.[2]

In 1995 CAN open protocol introduced, In 1999 Explosion of CAN-linked equipment in all motor vehicle and industrial applications[6].

Jakob Axelsson etin 2003 done a comparative case study of distributed network architectures for different automotive applications[12].

Johnson, R. Wayne, Evans, John L. Jacobsen, Peter, Thompson, James R, Christopher, Mark."The Changing Automotive Environment: High-Temperature Electronics", IEEE Transactions on Electronics Packaging Manufacturing pp.164-176, 27(2004) [13].

3. BLOCK DIAGRAM

The operation of power supply circuits built using filters, rectifiers, and then voltage regulators. Starting with an AC voltage, a steady DC voltage is obtained by rectifying the AC voltage, Then filtering to a DC level, and finally, regulating to obtain a desired fixed DC voltage. The regulation is usually obtained from an IC voltage regulator Unit, which takes a DC voltage and provides a somewhat lower DC voltage, which remains the same even if the input DC voltage varies, or the output Load connected to the DC voltage changes. This Block Dig.1 contains two sections. First one known runs with ARM as master node and another as normal ARM data acquisition node to which sensors are connected. Communications between two nodes are accomplished through High Speed CAN communication

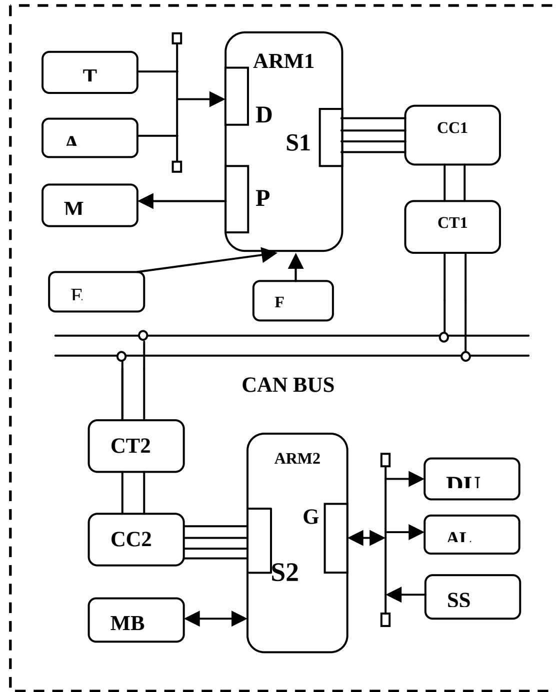

Fig 1 ARM Based Integrated Method for Calculating the Vehicle Parameters by Using CAN Protocol

T-Temperature Sensor

A-Alcohol Sensor

F-Fire Sensor

E-Eye Blink Sensor

SP-Speed Sensor

M-Motor Driver Unit

D-ADC

P-PWM

S1&S2-Serial Peripheral Interface

CC1&CC2-CAN Controller MCP2510

CT1&CT2-CAN Transceiver2551

G-GPIO

DU- Digital Display Unit

AL-Alarm

SS-Session Selection Inputs (Relay).

3.1 Module LPC2929

The KEIL MCB2929 Evaluation Board introduces the NXP LPC2900 family of ARM9 processor-based devices[11][1], allowing you to create and test working programs for this advanced architecture. The MCB2929 has a wide range of interfaces making it a great starting point for your next ARM project.

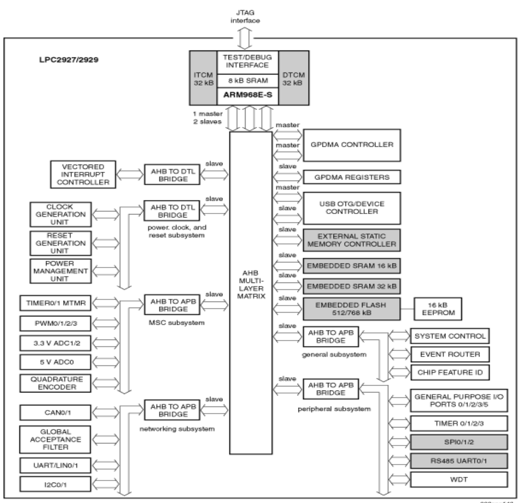

Fig 2 Block Diagram of LPC 2929

3.2 Temprature Sensor

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.

3.3 Power Supply Unit

The AC voltage, typically 220V RMS, is connected to a transformer,

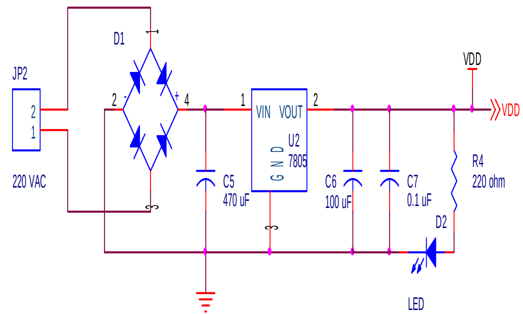

Fig 3 Power Supply Unit

which steps that ac voltage down to the level of the desired DC output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes.

3.4 LCD Module

Dot matrix LCD modules is used for display the parameters and fault condition.16 characters 2 lines display is used. It has controller which interface data's and LCD panel. Liquid crystal displays (LCD's) have materials, which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal. An LCD consists of two glass panels, with the liquid crystal material sandwiched in between them.

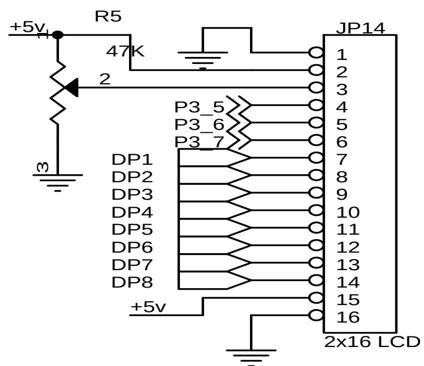

Fig 4 LCD Circuit

3.5 CAN

The development of CAN began when more and more electronic devices were implemented into modern motor vehicles. Examples of such devices include engine management systems, active suspension, ABS, gear control, lighting control, air conditioning, airbags and central locking. All this means more safety and more comfort for the driver and of course a reduction of fuel consumption and exhaust emissions.CAN or Controller Area Network [1] is an advanced serial bus system that efficiently supports distributed control systems. It was initially developed for the use in motor vehicles by Robert Bosch GmbH, Germany, in the late 1980s, also holding the CAN license. The CAN protocol uses the Data Link Layer and the Physical Layer in the ISO - OSI model. There are also a number of higher level protocols available for CAN.

3.6 Eye Blink Sensor and IR Sensor

This switch is activated when the user blinks their eye. It allows individuals to operate electronic equipment like communication aids and environmental controls hands-free. Each blink of the eye is detected by an infrared sensor, which is mounted on dummy spectacle frames. The sensor is connected to a hand-held control unit with a rechargeable battery.

3.7 RELAY

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit.

4. FRAMEWORK FOR PROPOSED SYSTEM

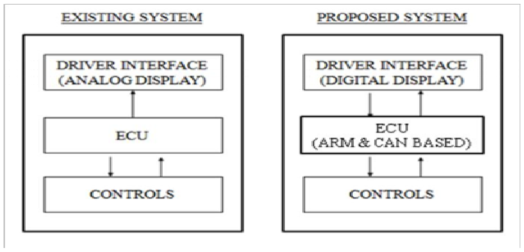

Fig 5 Existing and Proposed System

With rapidly changing computer and information technology and much of the technology finding way into vehicles.They are undergoing dramatic changes in their capabilities and how they interact with the drivers. Fig 5 shows the vehicle control of existing and proposed system. A vehicle was generally built with an analog driver - vehicle interface for indicating various parameters of vehicle status like temperature, pressure and speed etc. To improve the driver-vehicle interface, an interactive digital system is designed. A microcontroller based data acquisition system that uses ADC to bring all control data from analog to digital format is used. Since the in-vehicle information systems are spread out all over the body of a practical vehicle, a communication module that supports to implement a one stop control of the vehicle through the master controller of the digital driving system.

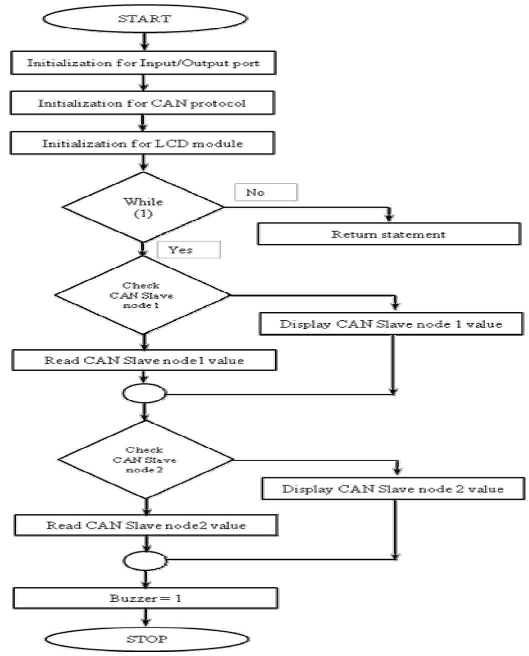

Fig 6 Flow Chart

5. ADVANTAGES OF PROPOSED SYSTEM

1. Fully automatic monitoring system.
2. High speed data collection.
3. Response time analysis can be done.
4.Timely Storage and Display of results.

6. RESULT

This project is concerned about implementation of CAN nodes for monitoring parameters. The monitoring parameters are temperature, battery voltage, light due to spark or fire and CO level in the exhaust. For monitoring the above parameters, LM35 sensor, 9V battery, LDR and MQ6 sensors are used. For implementing this, the programming of LED, ADC and LCD interfacing with microcontroller is done using Embedded C. The programming of microcontroller interfacing using CAN Protocol is verified using a general purpose board.

Fig 7 Complete hardware setup

7. CONCLUSION

This device track speed, Engine temperature and Alcohol consumption status. With its unique Dashboard Reporting Tools, Owners not only know answers to where, when, and how fast, but importantly they now have insights as to "how" their driver is driving. Dashboard Report provides a quick and easy to understand summary of behavior of each session.

REFERENCES

[1] Renjun Li, Chu Liu and Feng Luo, "A Design for Automotive CAN Bus Monitoring System", IEEE Vehicle Power and Propulsion Conference (VPPC) pp.1-5, 2008

[2] Steve Corrigan, "Introduction to the Controller Area Network", Published by Texas Instruments Application Report, SLOA101A, August 2002–Revised July 2008.

[3] Zhang Wen, Jiang Meng" Design of Vehicle positioning System Based on ARM", Business Management and Electronic Information (BMEI), International Conference 2011 IEEE.

[4] Lu Xutao1, Cui DongSen2" Design of Transport Vehicles Remote Monitoring System", 2nd International Conference on Education Technology and Computer (ICETC). 2010

[5] Peng Chen, "ShuangLiu, Intelligent Vehicle Monitoring System Based on GPS, GSM and GIS", WASE International Conference on Information Engineering. 2010

[6] Li, M., Design of Embedded Remote Temperature Monitoring System based on Advanced RISC Machine. Electrotechnics Electric, 06, p. 273, 2009.

[6] Pazul, "Controller Area Network (CAN) Basics", Microchip technology Inc., AN713, May 1999.

[7]http://micrium.com/rtos/ucosii/overview/

[8] ieeexplore.ieee.org/

[9] BISS0001 Micro power PIR motion detector IC datasheet.

[10] CAN specification version 2.0. Robert Bosch GmbH, Stuttgart, Germany, 1991.

[11] Andrew N.SLOSS, Dominic SYMES, Chris WRIGHT, “ARM System Developer’s Guide Designing and Optimizing System Software”, ISBN: 1-55860-874-5, Elsevier Books

[12] Jakob Axelsson etin 2003-distributed network architectures for different automotive applications.
User manual, Philips Semiconductor.

[13] Johnson, R. Wayne, Evans, John L. Jacobsen, Peter, Thompson, James R, Christopher, Mark. IEEE Transactions Electronics Packaging Manufacturing pp.164-176, 27(2004).

[14] MQ – 6 Gas sensor datasheet.

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