Safety and Security for Two Wheeler Vehicle Using ARM Controller & CAN protocol

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Abstract - *The present generation vehicles are much more intelligent than they were years back because modern engines are controlled by electronically using ECU. This paper presents the implementation of CAN protocol using ARM3 processor for monitoring of vehicle and sensor for Electronic safety of the vehicle. The main features of the system includes monitoring of, Engine temperature level, driver monitoring to avoid accidents, such as accelerometer monitoring through Control Area Network (CAN) which is a Serial bus standard for automotive application with low cost and reduction wiring complexity. The other important feature of the paper is secure for vehicle in parking areas in front of home and also avoid road accidents due to the over speed on the road turning problems. The software part is done in keil using embedded C.*

***Key Words*: Controller Area Network (CAN), Electronic Control Unit (ECU), ARM3, Keil, Embedded C…**

1. INTRODUCTION

Controller Area Network (CAN) is a bus mainly for automobile which is a shared serial bus communication protocol, Robert Bosch originally developed CAN in 1986 .The distributed control systems in cars are increasing which increases wiring costs of car body electronics led to the birth of the Automotive Serial "Controller Area Network" protocol. Although initially it was developed for the use of the automotive industry, its use quickly spread to a wide variety of applications in embedded systems like industrial automation wherever the high speed communication is required. With growing acceptance in various industries not necessarily related to the automotive industry, hence the protocol name was renamed as Controller Area Network (CAN).

On the production side we observe that the cost of electronics and IT is approaching the 50% threshold of all manufacturing costs. Perhaps more importantly, there are estimates that already more than 90% of all vehicle innovations are centered around software and hardware (admittedly not only digital hardware, though). So the embedded systems play an important role in the field of automobiles now a days. Active safety technology that helps to prevent accidents by assisting the driver in case of the loss of control of the vehicle. Especially effective in keeping the vehicle on the road and controlling rollover accidents which is vehicle for over 1/3 of all in vehicle accidents.

1.1 Temperature sensor

The Temperature sensor decides the measure of temperature present in the motor. At the point when the running vehicle, The LM35 in this manner has favorable position over direct temperature sensors aligned in ° Kelvin, as the client is not required to subtract an extensive consistent voltage from its yield to acquire helpful Centigrade scaling. The LM35 does not require any outside alignment or trimming to give average exact nesses of ±1/4°C at room temperature and ±3/4°C over a full −55 to +150°C temperature range. Minimal effort is guaranteed by trimming and adjustment at the wafer level. The LM35's low yield impedance, direct yield, and exact intrinsic adjustment make interfacing to readout or control hardware particularly simple. It can be utilized with single force supplies.

1.2 LCD

LCD consists of two glass panels, with the liquid crystal material sand witched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle.

2. BLOCK DIAGRAM

NXP's LPC1768 offers 100 pin connectors in an LQFP package, 70 of them being GPIOs ("'General Purpose Input/Output"'). The compact form factor of Chip1768 and its limited number of GPIOs made it necessary to make a selection, which of the LPC1768's GPIOs are used. Most of the mbed1768's GPIOs were kept unchanged in Chip1768, however, some enhancements were made.

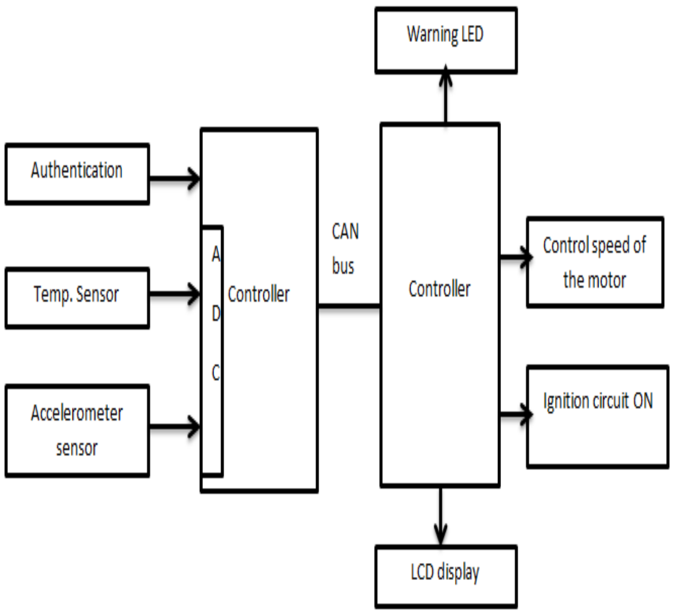

Fig -1: Block Diagram of Vehicle monitoring

Table -1: feature of ARM3controller

1	NXP ARM LPC 1768 Cortex-M3 processor working at frequencies 100MHZ
2	NXP ARM LPC 1768 Cortex-m3 worked in settled vectored interfere with controller (NVIC).
3	Up to 512kilo byte on chip streak programming memory
4	Up to 64kilo byte on chip SRAM
5	CAN2.0B consists controller with two channels
6	Its consists Two SSP controllers and FIFO and multiprotocol abilities
7	70 universally useful i/o pins with configurable resistors
8	12bit/8 channel simple/advanced converter(ADC)
9	One engine control PWM with backing for three-stage engine control

3. SYSTEM DESIGN

The ARM LPC2129 is a 16/32 bit ARM7TDMI-S CPU with 128/256 kilobytes of fast glimmer memory. A 128-piece wide inside memory interface and empower 16/32-bit code execution at greatest clock rate. For basic code size applications, the option 16-bit Thumb Mode, which diminishes code by more than 30% with insignificant execution punishment. With their smaller 64 and 144 pin bundles, low power utilization, it contains different 32-bit clocks, mix of 4 channel 10-bit ADC and 2/4 progressed CAN channels or 8-channel 10-bit ADC and 2/4 progressed CAN channels (64 and 144 pin bundles separately), and up to 9 outside interfere with pins these microcontrollers are especially appropriate for modern control, medicinal frameworks, access control and purpose of-offer. Number of accessible GPIOs goes up to 46 in 64 pin bundle. In 144 pin bundles number of accessible GPIOs tops 76 (with outside memory being used) through 112 (single-chip application). It works on double power supply. The CPU working voltage scope of 1.65V to 1.95V (1.8V +/ - 8.3%). The I/O power supply scope of 3.0V to 3.6V (3.3V +/ - 10%).

3.1 CAN OVERVIEW

The generation is increasingly Internet connected and networked environment. The various communication protocols are developed to reach this goal .The design of the protocol are based on the applications and differ from one another. In particular, as per industry standard the protocols are of "higher end" and the "lower end" protocols. The protocols like factory bus, address the overall factory system information protocols are called as the higher end protocols, while the fieldbus, address the inter processor communication as well as the sensor/actuator communication protocols are lower end protocols.

Table-2 Comparative case study of different protocol

	Feedback control	Discrete control	Diagnostics & Service	Infotainment & Telematics	Maximum Speed
CAN	primary use	primary use	primary use		1 Mbit/s
LIN		primary use			20 kbit/s
MOST				primary use	20 Mbit/s
FLEXRAY	primary use				10 Mbit/s
TTP/C	primary use				25 Mbit/s
TTCAN	primary use				1 Mbit/s

CAN uses a serial bus network to send message. The node connection is every node connected to every other node in the serial network, the need for a central controller for the entire network is made redundant. A block diagram of a typical CAN network used for communication is shown in Fig 2.

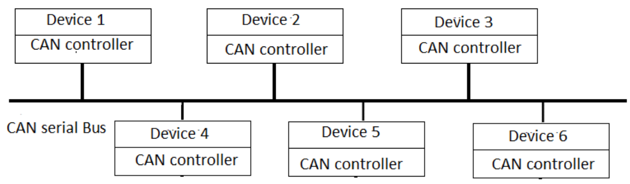

Fig-2 CAN communication block diagram

3.2 Specification

Controller	**ARM**
Size	16/32 bit
CPU operating voltage range	1.65V to 1.95V I/O
Power supply range	3.0V to 3.6V.
VDD	3.3V
VSS	Gnd

CAN BUS

Compatible with CAN specification 2.0B, ISO 11898-1.

Speed	125Kbps-1Mbps
Supply voltage	4.75V to 5.25V.
Supply current	5 to 15μA

Requirements

ARM Cortex M3 Lpc1768 Controller operating 100MHz frequency

Power Supply	5v DC, 12v DC.
Microcontroller	LPC1768-ARM 16bi
CAN Transceiver	TJA1040T
Accelerometer sensor	ADL3xx
Temperature sensor	LM35
LCD	16x2 Display, buzzer

Software use

Keil µ-Vision4 IDE

Embedded C

4. RESULT

Normally if you park somewhere or infant of your house bikes are stolen, so the security purpose we take measure care here we included keypad for password if you insert key then the keypad function will activate then you have to enter the password if the password is correct then only the relay will activate, otherwise if the entered is wrong password automatically buzzer will on for indication.

Fig-3 Indication for safety and security of motor bikes.

Fig-4 CAN initialization process.

Fig-6 4x4 keypad and LCD display

Fig-7 Reading engine temperature on LCD display

Here are more feature is that to monitoring engine temperature using temperature sensor, if the engine temperature exceeds the normal value automatically engine will off, up to the temperature come down to the normal value if its reaches to the normal temperature automatically engine will start.

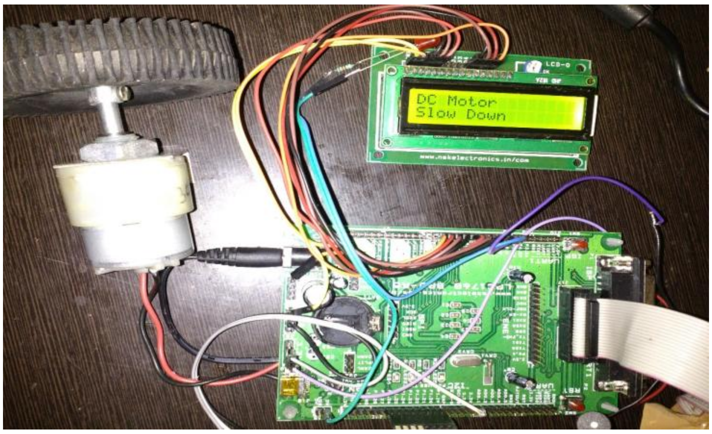

Fig-8 slowdown of the DC motor

5. CONCLUSIONS

Literature survey, study of ARM architecture, sensors, understanding of CAN and analyzing of Electronic stability program has been completed. Vehicle monitoring using sensors and CAN communication is completed successfully. Software and Hardware part of ESP has implemented.

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BIOGRAPHIES

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