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INTELLIGENT CAR SYSTEM USING ARM & CAN

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ABSTRACT

In this paper weintroduce a real time operating system for thevehicle which improves vehicle safetyand provides various automation facilities for the vehicle.This project mainly focus on process control monitoring of process states and value for intelligent CAR system. It mainly describes an application of CAN in automobiles. We have used CAN as a device which can enhance the utility, performance, speed & security of a system.Just to explain how a CAN be utilized in an automobile we have used two CAN nodes connected by 2 Mbps CAN bus. Temperature & voltage sensor at one node called as NODE Ais connected to CAN through master. The other node called NODE B is connected to slave B through CAN controller. In slave B an IR sensor & machine control is attached to exchange the automatic of automobiles. When the sensor at NODE A senses the change in temperature it captures the information and passes it to CAN connected at NODE A. CAN transfers this data to NODE B of CAN and then the NODE B slave displays it on LCD.An intelligent control system of car windows and doors based on CAN-bus was introduced earlier. The electrical motor and electronic control module of car windows are connected to the system via A to D module. Present Automobiles are being developed by more of electrical parts for efficient operation. Generally a vehicle was built with an analogue driver-vehicle interface for indicating various vehicle status like speed, fuel level, Engine temperature, obstacle alarm etc. We try to development and implementation of a digital driving system for a semi-autonomous vehicle toimprove the driver-vehicle interface. It uses an ARM based data acquisition system that uses ADC to bring all control data from analog to digital format and visualize through LCD.

KEYWORDS: ARM (Advanced RISC Machines),CAN(Control Area Network)

1. INTRODUCTION

In today's world, automation is needed in many systems which provide better performance. Large Numbers of systems are fully automated. An intelligent control system of car windows and doors based on CAN-bus was introduced earlier. The electrical motor and electronic control module of car windows are connected to the system via A to D module. Present Automobiles are being developed by more of electrical parts for efficient operation. Generally a vehicle was built with an analogue driver-vehicle interface for indicating various vehicle status like speed, fuel level, Engine temperature, obstacle alarm etc. We try to development and implementation of a digital driving system for a semi-autonomous vehicle to improve the driver-vehicle interface. It uses an ARM based data acquisition system that uses ADC to bring all control data from analog to digital format and visualize through LCD.Our project works out a CAN application layer protocol meet the system functional requirements, and designs the software and hardware for the system. Design the hardware and software for the CANBUS communication network. Hardware interface circuit mainly consist of ARM processor, CAN communication controller, high-speed opt coupler and CANBUS driver MCP 2551, and design schematic circuit diagram for CANbus system hardware. The software designs for CANBUS network are mainly the design of CANBUS data communication and exchange between nodes. The design of software communication module includes CAN initialization unit, message sending unit, message receiving unit and the interrupt service unit.

2. LITERATURE SURVEY

We develop this system based the previous system, that are used the old methodology. These technology has large disadvantages such as they are using A to D converter and such that they are electrically connected to main controller. Developed same system using a microcontroller based data acquisition system that uses ADC to bring all control data from analogue to digital format is used. Since the vehicle information systems are spread out all over the body of a practical vehicle. These collected data provides information to the main controller as a interrupt. By taking this the main controller works on it. Such system describe to control the DC motor based on the parameters like temperature changes using CAN protocol implementation. This Paper deals with the Control of DC Motor based upon the temperature changes that occur in a process in Industry. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is directly proportional to the Celsius (Centigrade) temperature. The Temperature changes are measured by the ADC and transmitted to the other node using the CAN Bus and the data is received at the other node based upon the data received the speed of the DC motor is Regulated using the PWM (pulse width Modulation) Technique. This PWM is achieved by on Chip Timers. The motor is connected to a cooling device to control the temperature. Here the disadvantages of such system that they has not any prevention of hazardous condition, such as obstacles detection. Also while not control on speed it has not any control on it. It also has not any traffic control system that makes so many problems. In today's world, automation is needed in many systems which provide better performance. Large numbers of systems are fully automated. Vehicle system is composed of automotive electrical architectures consist of a large number of electronic control units (ECU) carrying out a variety of control functions. In vehicle system we generally want greater safety, more comfort, convenience, pollution control and less fuel consumption. A modern vehicle may have many electronic control units (ECU) for various subsystems. Different such subsystems are airbags, antilock braking, engine control, audio systems, windows, doors, mirror adjustment etc. Some of these subsystems form independent or dependent subsystems. Communications. Present Automobiles are being developed by more of electrical parts for efficient operation. Generally a vehicle was built with an analogy driver-vehicle interface for indicating various vehicle status like speed, fuel level, Engine temperature etc., and this paper presents the development and implementation of a digital driving system for a semi-autonomous vehicle to improve the driver-vehicle interface. It uses an ARM based data acquisition system that uses ADC to bring all control data from analog to digital format and visualize through LCD. The communication module used in this project is embedded networking by CAN which has efficient data transfer. It also takes feedback of vehicle conditions like Vehicle speed, Engine temperature etc., and controlled by main controller.

3. SYSTEM OVERVIEW

The process starts with various components sensing the parameter from various parts of the vehicle. The information collected from these devices is then sent to the ADC and then ARM 7 microcontroller will process the data. Send the data through CAN bus which will then control the parameter of the vehicle.

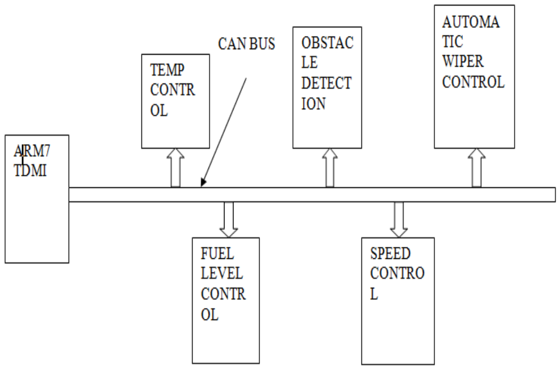

fig1. Block Diagram

This project introduces an embedded system with a combination of CAN bus systems. Digital control of the vehicle is an important criterion of modern technology. With the rapid development of embedded technology, high-performance embedded processor is penetrated into the auto industry, which is low cost, high reliability and other features to meet the needs of the modern automobile industry. The proposed high-speed CAN bus system solves the problem of automotive system applications, A typical drive system with the control unit has electronic fuel injection system, automatic transmission systems, antilock braking system (ABS), airbag systems etc. These units are the core components in a modern car system. They are sensitive for time and closed to the reliability and security of the entire system. Also includes the par of image processing. Here video camera used which always capture the images compare and indicates the direction to be changed, if it not changes as per image then it forces to change direction otherwise stop it.The CAN communications protocol, ISO-11898:2003, describes how information is passed between devices on a network and conforms to Open Systems Interconnection (OSI) model that is defined in terms of layers. Actual communication between devices connected by the physical medium is defined by the physical layer of the model. The ISO 11898 architecture defines the lowest two layers of the seven layer OSI/ISO model as the data-link layer and physical layer.

It consist of a following blocks-

1 POWER SUPPLY
2 ARM7TDMI PROCESSOR
3 LCD DISPLAY
4 SENSOR

The project works on two parts:

1. SENSOR CIRCUIT
2. DISPLAY UNIT

- The crystal would be used for generating the clock frequency and the RC network along with switch would be used for resenting the microcontroller and for power on reset.
- The LCD used is 16 X 2 for the Display.
- The output from ARM7TDMI processor is display

1. LPC 2129

The LPC2129 is based on a 16/32 bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, together with 128/256 kilobytes (kB) of embedded high speed flash memory. A 128-bit wide internal memory interface and a unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 and 144 pin packages, low power consumption, various 32-bit timers, combination of 4 channel 10-bit ADC and 2/4 advanced CAN channels or 8-

channel 10-bit ADC and 2/4 advanced CAN channels (64 and 144 pin packages respectively), and up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control. A.

2. CAN BUS IN AN AUTOMOBILE

CAN is a LAN (Local Area Network) controller CAN bus can transfer the serial data one by one. Fig 2 shows a typical architecture from an automotive. All participants in the CAN bus subsystems are accessible via the control unit on the CAN bus interface for sending and receiving data. CAN bus is a multi-channel transmission system. When a unit fails, it does not affect others. The data transfer rate of CAN bus in a vehicle system is different. For example, the rate of engine control system and ABS is high speed of real-time control fashion of 125Kbps to 1M bps. While, the rate of movement adjustment is low-speed with transmission rate of 10 to 125K bps. Others like multimedia systems use medium-speed rate between the previous two. This approach differentiates various channels and increases the transmission efficiency.

3. TEMPERATURE SENSOR LM35

The LM35 is an integrated circuit sensor shown in Fig.2 that can be used to measure temperature with an electrical output proportional to the temperature (in °C). It measures temperature more accurately than using a thermistor. The sensor circuitry is sealed and not subject to oxidation, etc. The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified. It has an output voltage that is proportional to the Celsius temperature. The scale factor is 0.01V/°C.

The LM35 does not require any external calibration or trimming and maintains an accuracy of +/-0.4°C at room temperature and +/- 0.8°cover a range of 0°C to +100°C. Another important characteristic of the LM35 is that it draws only 60 micro amps from its supply and possesses a low self-heating capability. The sensor self-heating causes less than 40.1°C temperature rise in still air. The sensor has a sensitivity of 10mV / °C.

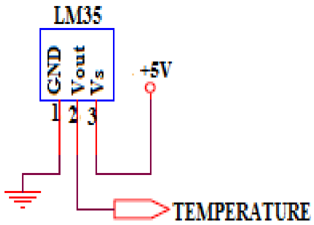

Fig.2 LM35 circuit

3. AUTOMATIC WIPING SYSTEM

Moisture/Rain: These sensors are usually mounted facing the windshield, behind the rear-view mirror. Typically, moisture-detecting sensors emit IR (infrared) light beams through the windshield. When rain droplets impinge on the outside of the windshield, a higher refractive-index rain/liquidlayer is created. Depending on design (i.e., the angle of IR beam incidence on the glass), the presence of rain on the windshield makes IR light either refract away more, or reflect back more

These sensors provide feedback signals for automatic windshield wiper control. When the rainfall begins, the wiper shouldautomatically starts function. It cleans the windshield and avoids driver intention while driving. In this existing system, the wiper motor should start wiping based on the intensity of rain in order to avoid driver intension. The rainfall can be classified asdrizzling, normal rainfall and heavy rainfall. If it is drizzling, the wiper motor functions very slowly. If it is normal rainfall, it should wipe atnormal speed. If it is heavy rainfall, it should wipe very fast. The humidity sensor [14] is placed outside the vehicle to monitor amount of air present in the atmosphere. Three threshold value is fixed for the classification of rain. If the power window is opened when drizzling or normal rain or heavy rain, it should slide up automatically. The sensor used here is SHT25 humidity sensor. Thehumidity sensor is connected to port P0.30 i.e., pin no. 33. This pin is ADC i.e., AIN3. The wiper operate automatically using PWM signal by speed control IC. The wiper motor used is 12v-5W DC motor and it is mounted below the windshield. The wiper is connected to the wiper motor and it slide over the windshield

4. OBSTACLE DETECTOR

As the distance to an object is determined by measuring the time of flight and not by the intensity of the sound, IR sensors are excellent at suppressing background interference. Virtually all materials which reflect sound can be detected, regardless of their colour. Even transparent materials or thin foils represent no problem for an ultrasonic sensor. Micro sonic ultrasonic sensors are suitable for target distances from 20 mm to 10 m and as they measure the time of flight they can ascertain a measurement with pinpoint accuracy. Some of our sensors can even resolve the signal to an accuracy of 0.025 mm. Ultrasonic sensors can see through dust-laden air and ink mists. Even thin deposits on the sensor membrane do not impair its function. Bottles in the packaging industry, can be implemented with ease. Even thin wires are reliably detected.

Infrared radiation is the portion of electromagnetic spectrum having wavelengths longer than visible light wavelengths, but smaller than microwaves, i.e., the region roughly from 0.75µm to 1000 µm is the infrared region. Infrared waves are invisible to human eyes. The wavelength region of 0.75µm to 3 µm is called near infrared, the region from 3 µm to 6 µm is called mid infrared and the region higher than 6 µm is called far infrared. (The demarcations are not rigid; regions are defined differently by many).

Sensors with a blind zone of only 20 mm and an extremely thin beam spread are making entirely new applications possible today: Fill level measurement in wells of micro titter plates and test tubes, as well as the detection of small.

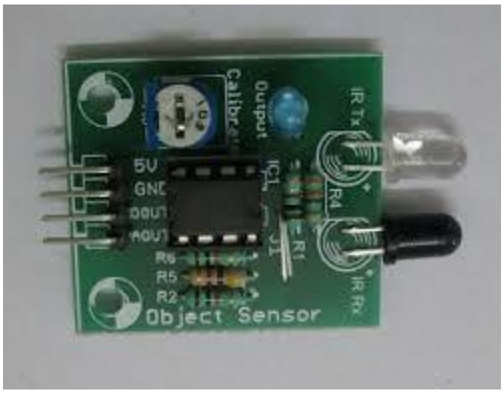

Fig.3 IR sensor

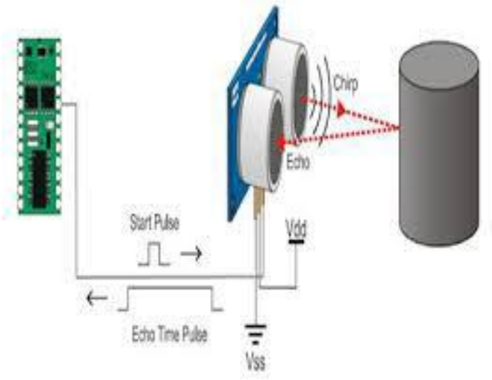

Fig.4 Obstacle detection circuit

5. FUEL INDICATOR

According to information contained in the data messages our proprietary software in vehicle already displayed the engine speed and instantaneous fuel consumption in the required form and in the appropriate units (after starting the engine).

As noted in a study by the authors V ykydal et al. (2012) is possible using data from the CAN-Bus evaluate a large variety of parameters for example during the field tests of agriculture tractor. Application of CAN-Bus during tractor pulling tests under field conditions described also Super et al. (2012). A possible problem that can occur by using data from the CAN-Bus is the scanned data accuracy. With the evaluation of accuracy of fuel consumption and data acquired from CAN-Bus of agriculture tractor dealt study by the authors Polarity al. (2013) or Sedlák et al. (2011). Results of the study show that in certain engine modes engine ECU can determine inaccurate value of instantaneous fuel consumption.

Fig.5 fuel indicator

6. Speed Control

This speed control parameter is to automatically control the speed of the vehicles at speed restricted areas such as school and hospital zone etc.

7. CONCLUSION

An effective solution is provided to develop the intelligent vehicle which will monitor various parameters of vehicle in-between constant time period and will send this data to the base unit is explained in this paper. By using hardware platform who's Core is ARM7 and CAN. The designed system could finish the function of communicating with the base station via CAN, obstacle Avoidance testing and control of various parameters. The whole Control system has the advantage of small volume and high reliability. Future scope of that is to control the accidents and positioning the accidental vehicle.

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