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Optimizing vehicular communication system Using TCP/IP

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Abstract: **Nowadays, the electronic control system has become more intelligent and advanced to make cars safer , more comfortable and environment-friendly. With this trend, it becomes more difficult for an electronic control unit to centrally control all the system in a vehicle, which leads to decentralized control by using the in-vehicle LAN or integrated control by multiple electronic control units. This paper introduces both our approaches to the development for the in-vehicle LAN system that is becoming crucial platform technology for the electronic control system, and our development of the gateway technology for networking that is one of our current development themes. In this proposed project work, various physical systems sensor readings can be measured and by calibration other subsystem function can be predictable. The project is implemented with ARM core on an Ethernet communication. From the engine part ARM core, the sensor readings will be continuously transmitted to the dash board part ARM core. In dash board, the threshold comparison will be done and sensor failure can also be identified. Using fuel level and the engine speed, we predicted distance to which the vehicle can go. If any hardware system is failed in the vehicle means, by load current we can identify the fault. The dash board display gives trouble shooting information to the user. By this project work we can maintain the health of an automobile system to extend level.**

Keywords: **LAN, ARM7, Ethernet controller.**

I. INTRODUCTION

Intelligent Transportation System is a crucial part of a country's information construction. With the increasing city holdings of cars, there are more and more traffic jams, so requirements are that Intelligent Transportation needs more improvement. The key technology Of Intelligent Transportation is Vehicle positioning System, while the key of which is vehicle controlling System. Vehicular communication (VC) systems will enable many exciting applications that will make driving safer, more efficient and more comfortable. But this necessitates the introduction of security and privacy enhancing mechanisms. In this paper we focus on practical aspects associated with the implementation and deployment of such a secure VC system. We also provide an outlook to future research challenges.

Technological trend of the in-vehicle LAN system:

Since around 2005, new sensors including radars, cameras and others that can be equipped in car have been developed. The new ECUs that materialize advanced safety functions such as pre-crash safety have been installed along with these sensors. Because of the sharp increase in nodes connected to in-vehicle LAN system and quantity of information data coming in/out of the system, multi-channel networks have become popular, where the in-vehicle LAN system consists of multiple sub-networks. Today, in some high-end vehicles, the in-vehicle LAN system has 3- or 4-channel CAN sub-networks with multi-channel LIN local-networks. The information data transfer between these sub-networks is achieved by adopting an exclusive gateway ECU or giving gateway functions to an ECU connected to multiple sub-networks.

II. DESIGN AND IMPLEMENTATION

In this project we are using the ARMlpc2148 processor.IN which we use the GPIO pheripheral, SPI pheripheral, UART pheripheral and ADC pheripheral. IN sensor there will be analog sensor and digital sensor. In this webserver application, we use a gas sensor of analog type. Gas sensor will be connected to the ADC pheripheral of channel 1, which is P0.25. This channel will read the analog value and convert it into digital value.LM35 is connected to the P0.30 which is ADC channel 3. CT and PT are connected to a signal conditioning circuit. A signal conditioning circuit will convert the analog voltage into digital which will be done with the help of a rectifier circuit. And then a capacitor is added to filter the ripples present in the circuit. Finally a potentiometer is used to convert the voltage into the desired level of ADC channel of ARM. Because ARM can tolerate up to a voltage of 3.3v. In above diagram CT output is connected to P0.28 and PT is connected to P0.29. Ethernet IC ENC28j60 consists of CS, SCLK, MOSI , MISO which are connected respectively to P0.15, P0.14, P0.13 and P0.12. These are the SPI pheripheral blocks used for the Ethernet packet transmission in this project.

In diagram, relay uses an electromagnet. This is a device consisting of a coil of wire wrapped around an iron core. When electricity is applied to the coil of wire it becomes magnetic, hence the term electromagnet. The A B and C terminals are an SPDT switch controlled by the electromagnet. When electricity is applied to V1 and V2, the electromagnet acts upon the SPDT switch so that the B and C terminals are connected. When the electricity is disconnected, then the A and C terminals are connected. It is important to note that the

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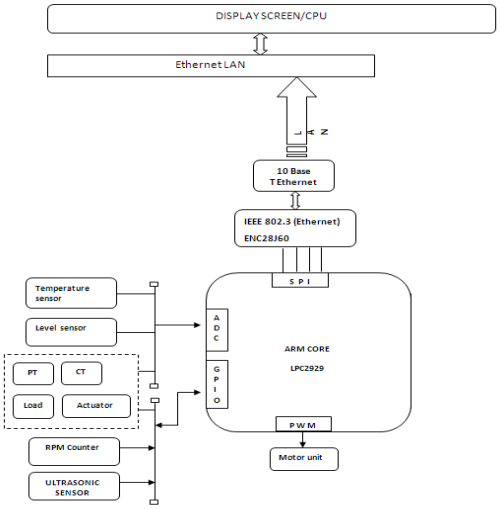
electromagnet is magnetically linked to the switch but the two are NOT linked electrically. Normally-open (NO) contacts connect the circuit when the relay is activated; the circuit is disconnected when the relay is inactive. It is also called a Form A contact or "make" contact. Normally-closed (NC) contacts disconnect the circuit when the relay is activated; the circuit is connected when the relay is inactive. It is also called a Form B contact or "break" contact .Based on web page instruction, the common point of the relay will join to NC or NO contact. Relay is connected to the GPIO P1.30.
MAX3232 is compatible with RS-232 standard, have dual transceiver. Each receiver converts TIA/EIA-232-E levels into TTL/CMOS levels. Each driver converts TTL/CMOS levels into TIA/EIA-232-E levels.

III. BLOCK DIAGRAM

Web server blocks diagram representation:

i. User has to connect the LAN cable to RJ45 connector. Then Led indicators in Ethernet controller board will starts blinking. Indicating the web server Ethernet packet transmission.
ii. User has to give an IP address 192.168.1.60 in any web browser for the server activation.
iii. Temp sensor input also given to controller which is also monitored from remote places
iv. Level sensor value will be displayed in the web page for monitoring purpose.In case if the value of gas exeeds the threshold , then automatically as sms will go the user defined number.
v. CT , PT are used to calculate the load current measurement, which will be displayed in the web page for reference.
vi. Each actions of the devices updated in the webpage through Ethernet controller
vii. If client, wants to change action of device then he/she entered data through web page
viii. This data get by receiver and then corresponding device controlling function will be performed in the device section.



IV. SYSTEM HARDWARE

Microcontroller: LPC2148 Microcontroller Architecture based on ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers (CISC). This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core. Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory. The ARM7TDMI-S processor also employs a unique architectural strategy known as Thumb, which makes it ideally suited to high-volume applications with memory restrictions, or applications where code density is an issue. The ARM7TDMI-S processor has two instruction sets: The standard 32-bit ARM set.

A 16-bit Thumb set: The Thumb set's 16-bit instruction length allows it to approach twice the density of standard ARM code while retaining most of the ARM's performance advantage over a traditional 16-bit processor using 16-bit registers. This is possible because Thumb code operates on the same 32-bit register set as ARM code. Thumb code is able to provide up to 65% of the code size of ARM, and 160% of the performance of an equivalent ARM processor connected to a 16-bit memory system.

Ethernet: Ethernet is a large and diverse family of frame-based computer networking technologies for local area networks (LANs). The name comes from the physical concept of the ether. It defines a number of wiring and signalling standards for the physical layer, through means of network access at the Media Access Control (MAC)/Data Link Layer, and a common addressing format. On top of the physical layer Ethernet stations communicate to each other by sending each other data packets, small blocks of data that are individually sent and delivered.

Ultra Sonic: Sensor Our ultrasonic rangefinder is capable of allowing the user to determine his or her distance from an object or wall. When deciding on what type of project to design and construct, we decided that we wanted to create something that would have some practical use in life. Many groups in the past created video games, but we wanted to be different. We considered issues such as safety, user interface, and ease of use, and came up with the idea of making an ultrasonic rangefinder. A rangefinder can be used in various applications such as a measuring device or an obstacle detection device.

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V. SYSTEM SOFTWARE

Keil compiler is software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.

VI. CONCLUSION

Sensors connected are ultrasonic, LM35, RPM, and level sensors. The master node collects all these information through onchip peripherals and broadcast it through the Wi-Fi module which can be monitored by the server section. This will bring quicker response in the vehicle network to overcome any problem.

VII. ENDEAVOR FOR FUTURE TECHNOLOGY OF THE INVEHICLE LAN SYSTEM

As the in-vehicle LAN system is notably advancing, auto manufacturers face challenges of efficient development and ensured reliability. In order to deal with these challenges, the movement of standardizing the in-vehicle LAN structure is emerging, and a flexible LAN structure in car is pursued to apply to various classes of cars raging from the compact car equipped with little electronic devices to the high-end car heavily equipped with them. We, as an ECU supplier, started discussion on standardization of the in-vehicle LAN structure with car manufacturers from 2003. At the discussion on the basis that we would standardize the multi-channel in-vehicle LAN system comprised of multiple CAN sub-networks, the mainstream at present, we found it inevitable to improve performance of the gateway that deliver information between sub-networks. If a faster communication protocol like FlexRay or other current protocols is adopted for a part of sub-networks, the improved gateway function will help enhance the standardization of the in-vehicle LAN structure.

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